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SUGGESTIONS

REGARDING

FOREST ADMINISTRATION

IN THE

MADRAS PRESIDENCY,

110369

BY

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INSPECTOR-GENERAL OF FORESTS TO THE GOVERNMENT OF INDIA.

WITH ONE MAP.

Dated Madras, the 10th January 1883.

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SUGGESTIONS

REGARDING

FOREST ADMINISTRATION

IN THE

MADRAS PRESIDENCY.

PART FIRST.

CHAPTER I.

GENERAL.

In September 1881 I was instructed to proceed to Madras, and to confer with the Madras Government on the whole subject of forest conservancy in that Presidency. I arrived at Madras on the 3rd November, and having obtained the permission of Government to visit the forests in certain districts, I started on my tour on the 21st November, and, after its completion, arrived at Ootacamund on the 21st of March 1882.

2. On this tour I marched through the Chingleput and Nellore Districts, in order to see the management of Jungle conservancy under Collectors; examined a portion of the Cuddapah forests; marched through a large portion of Bellary and the new district of Anantapúr; then proceeded to Salem, South Arcot, and Tinnevelly; and, after seeing something of Madura, completed my tour in the Coimbatore District.

During my stay on the Nílgiris, from March to November, I made myself acquainted with the forest on the plateau and the slopes. I was also engaged on the Forest Bill and on the reports now submitted, and returned to Madras on the 15th November.

3. On the 3rd April I submitted to the Government of Madras a rough draft Forest Bill, together with an explanatory memorandum, in which I sketched the outlines of the general policy which I considered should be followed in forest matters. In the preparation of this Bill I had the assistance of Mr. A. J. Stuart, now Collector of North Arcot, and of two Forest Officers, Messrs. A. W. Peet and H. L. Wooldridge, with whom I had discussed these matters while inspecting the forests of their districts—Coimbatore and South Arcot—and whom the Government of Madras, at my request, permitted to come for a short time to Ootacamund.

4. In order to consider the proposals which were under preparation by me, and in order to prepare a Bill to provide for the protection and management of forests in this Presidency, the Government, in their orders of the 24th March, appointed a Committee, consisting, besides the Conservator, Major Campbell Walker, and myself, of the following officers:—

Honorable P. O'Sullivan, Advocate-General.
Mr. E. Forster Webster, Secretary to Government, Revenue Department.
Mr. W. S. Whiteside, Collector of North Arcot.
Mr. W. Logan, Collector of Malabar.
Mr. H. E. Stokes, Collector of Salem.

Mr. A. W. B. Higgens, Acting Head Assistant Collector, Cuddapah, was appointed to act as Secretary, and, after the labors of the Committee had termi-

nated, the Government of Madras most considerately permitted him to remain with me at Ootacamund, to assist me in preparing the present report. He has since been appointed to the charge of the forests of the Cuddapah District. Mr. Higgens was succeeded by Mr. H. A. Sim, Acting Head Assistant Collector, Kurnool, who has assisted me in passing the report through the press. Mr. Sim has been appointed to the charge of the Kurnool forests.

The Committee assembled at Ootacamund on the 1st May, and on the 10th June submitted the draft of a Bill, with a comprehensive report on forest legislation in the Madras Presidency. This report will be found as Appendix I. A copy of the Bill, as submitted by the Committee, is Appendix II.

5. On the 15th May the Government directed that the three Collectors on the Forest Bill Committee should, in communication with the Conservator and myself, consider the rules by which the relations of Civil and Forest Officers should in future be regulated, and on this subject, as well as on matters relating to the organization of forest business connected therewith, a Joint Report was submitted to Government on the 9th June. This report will be found printed as Appendix III.

On the 9th September I submitted proposals for the reorganization of establishments, with a financial forecast, which are incorporated in the present report.

6. The Forest Bill was introduced into the Legislative Council on the 29th June, and, after having been altered in several essential points by the Select Committee, was passed on the 26th August, and received the assent of the Governor-General in October. A special Act (XXI of 1882), confirming its provisions, was also passed in the Council of the Governor-General, and received the assent of the Governor-General on the 2nd November 1882. A copy of the Madras Forest Act will be found as Appendix IV. The old Government Forests Act (VII of 1865) was never extended to the Presidency of Madras, and the present Act is the first forest law enacted for this Presidency. In the following remarks I shall, without entering into minor matters, briefly indicate a few of the more important points, in which the Madras Act differs from the Indian Forest Act (1878) and the Burma Forest Act (1881).

7. The general frame-work of the three Acts is similar. After the needful preliminary clauses, which require no remark, these Acts deal: *first*, with reserved forests [Chapters II and V (partly) of the Indian Act, and Chapter II of the Burma and Madras Acts]; *second*, with land at the disposal of Government not included within reserved forests, [Indian Act, Chapters IV and V (partly); Burma Act, Chapter IV; Madras Act, Chapter III]; and, *third*, with land not at the disposal of Government or in which Government has a limited interest. Under this head the Burma Act has no provisions, as they were not wanted in that province. The Indian Act contains the needful provisions in Chapter VI and Sections 79 and 80. In the Madras Act all sections relating to this subject are included in Chapter IV.

Provisions regarding village forests, contained in Chapter III of the Indian and Burma Acts, have not been included in the Madras Act, for reasons which will be explained further on.

While the chapters named relate to lands, the concluding chapters of the three Acts contain provisions regarding general matters.

8. Under Reserved Forests the most important difference is in the matter of appeals from the decisions of the Forest Settlement Officer. Under the Indian and Burma Acts the appeal from the decisions of the Forest Settlement Officer in all cases lies to an officer of the Revenue Department appointed by Government to hear such appeals, it being, under the Indian Act, open to Government to appoint, in the place of a single officer, a Court composed of three persons appointed by the Government to hear such appeals.

The Madras Act makes a distinction between two classes of cases. In the case of claims to rights of occupancy and ownership, the appeal from the orders of the Forest Settlement Officer lies to the District Court (Section 10), while in the case of claims to rights of way, water-course, pasture, and to forest-produce, the appeal lies to a Forest Court, or, where no such Court has been constituted, to an officer of the Revenue Department appointed by the Government (Section 14). Chapter VI prescribes the constitution and functions of the Forest Court. The

Court will ordinarily consist of the District Judge, the Collector, and a person not in the service of Government.

In regard to land at the disposal of Government not included within reserved forests, the Madras Act follows the lines of the Burma Act, and does not attempt to constitute a separate class of forests (Protected Forests), as is done by the Indian Act. It does not, however, contain any provisions regarding reserved trees, but provides, in Section 27, that land at the disposal of Government, if fired wilfully or negligently, may be closed against pasture.

Interference with the management of forests in land not at the disposal of Government is authorized for purposes similar to those for which it is authorized by the Indian Act, but the procedure described to enforce the orders of Government passed in such cases is different.

There are differences between the three Acts in the concluding chapters which relate to general matters, but they do not call for notice in the present place.

9. The arrangement of the present report will be as follows:—After the first or introductory chapter, it will deal with the provision of fuel to railways; of charcoal for iron smelting; with the indirect influence of forests; and, lastly, with the organization of forest business. Following these five general chapters, there will be a chapter regarding the forests of each of the districts which I have been permitted to visit. One chapter deals with the forests in the Bhadráchalam and Rékapalle taluks of the Godávari District, which I have not visited, but regarding the management of which I was requested to give my opinion.

The present report will be submitted on the eve of my retirement from the service. This circumstance has imposed upon me the necessity of setting forth my views more fully than I should otherwise have done. I shall not have an opportunity hereafter of explaining my proposals in case of doubt, and hence it seemed necessary to state them in sufficient detail in this report in order to prevent, as far as possible, misconception regarding them. Some repetitions were unavoidable, and I much regret the great length of the report. Such reports are not intended to be easy reading, and the greater portion of the present report is only intended to be read by the Forest Officers employed in the districts to which my remarks relate. My chief object was to draw the attention of Forest Officers to certain points which require their attention in the ordinary course of their business.

Among the large mass of statistical data published in district Manuals, recorded in the Annual Administration Reports, the Jamabandi Reports of the Board of Revenue, the Annual Forest and Jungle Conservancy Reports and other official documents, I have endeavoured to select those figures which are most likely to be correct. This part of my work has been singularly difficult on account of the discrepancies between the figures recorded in different public documents.

The systematic names of trees and shrubs are those adopted in Hooker's Flora of British India and other standard works, and hence I have, as a rule, omitted the authority for these names. In a few cases the identification is doubtful, but vernacular names and other indications will enable others to correct any mistakes into which I may have fallen. It would have been a pleasure to examine thoroughly the trees and shrubs with which I found myself surrounded on my tour. This pleasure I had to forego, in order to give my undivided attention to the much weightier questions of forest management with which I had to deal.

10. In submitting the present report, I desire to acknowledge the ready assistance which I have received in this work from the Board of Revenue, from Forest Officers, from Collectors and their Assistants, and from other public officers. I am very grateful to the Government of Madras for the support and confidence which they have given me to the last.

The whole of the forest receipts and charges will in future be Provincial, and the heavy outlay which the organization of forest business will require will entirely fall upon the provincial revenues of the Presidency. The Government of Madras have justly insisted upon the organization of a strong staff of superior officers and no reasonable expense has been spared to attain this object. Three experienced Forest Officers from the Provinces under the Government of India have been transferred to this Presidency, two passed junior civilians of the Madras establishment have been temporarily appointed as District Forest Officers, four

professionally trained junior Assistant Conservators have joined, and the old officers of the Madras Forest Department have, by the introduction of the new scale, received the advancement which they had merited. I have been permitted to see the new organization actually established, and I leave the Presidency with the firm hope that the Madras Forest Officers will in future take a high place for professional skill and efficiency, and that they will accomplish a work of the utmost importance for the well-being of the people in South India.

The growth of forest is primarily influenced by the climate, and in India the most important climatic factors in regard to forest growth are rainfall and atmospheric moisture. Most of the rainfall data, recorded in this report in connection with the character and distribution of forests, were kindly communicated to me by H. F. Blanford, F.R.S., Meteorological Reporter to the Government of India. I desire to take this opportunity to acknowledge this and other important information which Mr. Blanford has given me regarding the climatic conditions of that part of the Peninsula to which the present report relates.

Objects of Forest Conservancy.

11. The advantages expected to be secured by forest conservancy in the Madras Presidency, as in other Provinces of the Indian Empire, are of two classes, direct and indirect. The direct advantages are easily defined. They comprise the provision of a permanent and sufficient supply of timber, wood, and other forest produce for local use and for railways, iron smelting, towns, and the trade generally. Regarding the indirect advantages opinions differ. The extent to which forests influence the climate, the under-ground and surface drainage, remains still to be proved, and this subject will therefore be discussed in a separate chapter; but certain indirect advantages are obvious, and these are: that in a hilly country, forests protect the surface soil against erosion, and diminish the quantity of sand and silt carried down by rivers; that they help to fix moving sands, afford shelter against winds, particularly against the scorching winds of the hot season; and that, during the dry season, well-stocked forests tend to increase the atmospheric moisture and dew in their immediate vicinity.

To this extent the advantages of forest protection will probably be generally admitted; but at the outset I desire to state, that we must not expect to attain these advantages to the full extent from any but dense and completely-stocked forests. Broadly speaking, it may be said that the forests of this Presidency, whether natural or artificial, are of two classes: dense and fully-stocked forests, and open imperfectly-stocked jungles, with scattered trees and shrubs, which are annually devastated by the fires of the hot season, the ground being either rock and stones denuded by the unchecked wash of the monsoons, or soil which becomes hard and baked during the dry season. In the forests of this last-named class, the annual production of timber and other forest produce is small, and the indirect influence of such forests is insignificant.

Hence we may say that the aim of the forester must be to maintain existing well-stocked forests in a good condition, and, where necessary, to improve them, and to convert open and unproductive tracts into well-stocked forests.

12. As regards the direct advantages of forest conservancy, it is of the greatest importance to produce on the smallest area the largest quantity possible of useful timber, wood, and other forest produce; and it is necessary to determine the yearly quantity which, under good management, can be produced permanently on a given area. In some of the forest plantations of this Presidency the annual timber production per acre is exceptionally large. Instances are the teak plantations of Nilambur in Malabar, the plantations of blue gum on the Nilgiris, of Casuarina on the coast, those of *Acacia arabica* and *Inga dulcis* in tank beds and on low ground along rivers. And it is not impossible that in suitable places plantations of mahogany would show a similar result, and that the production per acre of the pods of divi-divi (*Cæsalpinia coriaria*) will, under favorable conditions, be found to be extraordinary.

It is not in all cases the largest yield in material which produces the largest net revenue from a forest. This question, however, need not be discussed at

present. In any case it is most important to determine the rate at which useful and marketable forest produce, such as wood and timber, can be produced in different localities and under different systems of management. For determining the growth of teak at Nilambur Colonel Beddome's researches (Report on the Nilambur teak plantations, 1878) have laid a good foundation; and, regarding the Australian trees planted on the Nilgiris, Mr. D. E. Hutchins, Deputy Conservator of Forests, Mysore, has, under the orders of the Government of Madras, carried out important researches this year. It now remains to determine the rate of timber production per acre in the plantations in river beds and tank beds, and in the Casuarina plantations inland and on the Eastern Coast.

Without accurate knowledge of these matters, foresters work in the dark. Whether the wood is to be used for the railway or for iron smelting or for other purposes, it is necessary to know the quantity which can be produced annually on a given area.

In several chapters of this report assumptions regarding the annual yield of Forests and Plantations have necessarily been made, but in most cases these assumptions had to be based upon insufficient data. The sooner reliable data regarding this most important subject can be established by exact researches the better.

Better utilization of Waste Lands.

13. The aim of forest conservancy may also be regarded from another point of view. Statement I appended to this report shows the area of the Government unoccupied lands in 18 out of the 22 districts, as well as the details of occupied Government land, and the relation of areas to population. It may justly be said that the chief task to be accomplished by forest administration in this Presidency, is to increase the productiveness and utility for the people of the country of the waste and forest lands which are at the disposal of Government. According to that statement the total unoccupied area in the 18 districts, for which reliable data have been established, is 31 million acres, which may be sub-divided as follows:—

	ACRES.
Assessed	9 millions.
Unassessed	22 do.
Total ...	31 do.

14. In addition to this, in the districts for which no details are entered in statement I, the following areas of forest and waste are believed to be at the disposal of Government:—

	ACRES.
Malabar	46,720
Nilgiris	347,643
South Canara	160,552
Total ...	554,915

and it is probable that the area at the disposal of Government in South Canara is very much larger than that here stated. Hence, roughly speaking, the total area of forest and waste at the disposal of Government in the Madras Presidency may be put down at 32 million acres.

15. This area, however, includes a large extent of forest and waste which is claimed by Zemindars and other landholders, in the Tinnevelly, South Arcot and other districts. Several of these disputes are of long standing, and they have seriously hampered the efforts hitherto made for a better utilization of the land at the disposal of Government in these districts. In the interests of the country, every effort should now be made to bring these disputed claims to a final settlement.

Portion available for extension of Cultivation.

16. What, then, is the final destination of this large area of waste and forest? A portion will be constituted reserved forest under the Act; extensive areas will

remain as grazing grounds; and a large portion will, it is hoped, be made available for the extension of cultivation. I maintain that the area available for this purpose will increase in proportion as the efforts made to improve the condition and productiveness of forest and grazing lands are crowned with success.

In some portions of the dry inland districts of this Presidency, cultivation has already attained its maximum extent compatible with the prosperity of the country, and in these tracts all efforts must be directed towards the improvement of forests and grazing grounds; but here also it is probable that though at first it will be necessary to demarcate extensive areas as reserved forests, it will be expedient hereafter, after the forest has become dense and compact on these areas, to set apart for cultivation selected tracts, the soil of which has become enriched by forest growth, and where the water-supply in springs and wells has been improved and rendered safe, even in seasons of drought, by the protection of the surrounding hills.

17. I may, perhaps, be permitted to illustrate my meaning by reference to a forest tract outside the Madras Presidency. A glance at the map prefixed to my Report on the School Forests in the North-Western Provinces, of 1879, will show that a large tract, comprising the Siwálik range of hills, extending from the Jumna to the Ganges river, 44 miles long and about 11 miles wide, and measuring about 310,000 acres, has been demarcated as a reserved forest. And there are other extensive tracts of forest in the outer hills of the Himalaya between the Ganges and Sarda rivers. In these tracts it is intended eventually to establish forest villages, after the protection and management of these lands has been established sufficiently to enable this to be done without risking the maintenance of the forests. I quote the following passage from a report on the forests of the North-Western Provinces and Oudh, which I submitted to Government in November 1881:—

"Within the limits of the forests here described there are many places which, at one time or other, were cultivated and inhabited, and in many instances such localities are not likely ever to become stocked with valuable forest. As the selection of the areas set apart for the production of timber progresses, it will probably be found possible to lease out the lands suitable for cultivation, and to encourage the establishment of villages in the forests. Due precautions must, as a matter of course, be taken to guard against injury to the forest set apart for the production of timber, and this can be assured by assigning to each village a suitable area of forest land in its immediate vicinity for the pasture of cattle and the provision of wood and other forest produce. At first sight this seems a bold measure to propose, and each step in this direction must be taken with the greatest caution. These forest villages must not of course be permitted to degenerate into cattle stations, requiring larger areas for pasture than those assigned to them for that purpose. The control of these forest villages in all matters pertaining to land tenure and revenue should remain with the Forest Officers. The greatest attention should be paid to the establishment of a good system of agriculture, and, if this is done, these forest villages may become models to the villages outside the forests, which naturally cannot receive the same share of time and attention by intelligent and well-trained officers."

18. Model farms of large extent, sufficient to yield a surplus under the management of skilled officers, will probably be found to be the most effective means for gradually improving the existing system of agriculture in this as in other parts of India. It is not impossible that some of the proposed forest villages may be used as model farms, and that the financial success of their management may induce the people in the neighbourhood to imitate the system followed, in the same manner as the management of the State forests, where it has been successful, is being imitated and copied by native landholders.

19. It might be objected that if this is intended, it would be much better not to have included at all within forest limits such areas as are suitable for cultivation. Indeed the opinion has been repeatedly expressed by officers in this Presidency, that no culturable lands ought to be included within reserved forests. But in that case we should in many instances not be able to establish efficient protection in these forests at all. Forestry is as yet a new business in India, and, in order to secure success at the beginning, it is necessary to deal with the problem of forest protection in its easiest form. We must at the outset only undertake the protection of compact areas of suitable size with convenient boundaries. At a later stage of the proceedings, when Forest Officers have learned the business of protection, and when the people are accustomed to respect forest boundaries, it will be possible to embark upon a bolder policy, and to settle forest villages in those tracts which are better

suited for cultivation than for the growth of timber. And in these tracts the soil will then have become improved by protection, and in most cases a more abundant water-supply will have been secured.

20. I may perhaps be permitted to mention, that in some parts of Germany, where forest management has been brought to a high state of perfection, and where consequently the production per acre of wood and timber has been greatly increased, a movement is now beginning, the object of which is to urge the sale by the Government of selected portions of the State forests, in order to give room for the extension of cultivation. Owing to the increased production of wood and the increased use of coal, a smaller area is now, in many districts, found to be sufficient for the requirements of the country. This has for some time past been foreseen by those who were acquainted with the real state of things, and it seems not impossible that the result will be to make a very large area of excellent land available for cultivation, the fertility of which has much improved by forest growth. These schemes however it would be premature to propose in this Presidency, where the constitution of reserved forests is only now commencing, and where efficient forest protection has as yet only been accomplished in a few places. Nevertheless it is well at the outset to know to some extent the future probable development of the measures which we are initiating.

21. But apart from the larger scheme of eventually establishing forest villages in the reserved forests proposed to be formed, it is certain that the lands in the neighbourhood of well-stocked forests will be more productive than those situated at a distance from the forests.

It must now be distinctly recognized, that not only does the provision of timber and firewood come within the legitimate scope of forest administration in India, but one of its most important duties will in future be to increase the supply of cattle fodder, particularly during seasons of drought in the drier districts. The importance of this feature of Indian forest administration has by no means yet been sufficiently recognized. On the bare and dry hills of Ajmere and Merwara an area, aggregating 100 square miles, has been demarcated and placed under strict protection; these operations were undertaken, in the first instance, with the view of improving the water-supply in tanks and wells, upon which cultivation in these districts chiefly depends. The principal advantage, however, which has manifested itself up to date, as the result of these operations, is that the supply of grass has increased largely. The conditions under which these reserves are established permit the people in the vicinity to cut grass in them, and, during several seasons of drought which have occurred, the increased supply of grass, under the shade of the trees and brushwood which have grown up under protection, has been extremely useful. These reserves in Ajmere are only a beginning on a small scale, and operations of a similar character should be undertaken in all districts which are situated in the dry regions of India.

It is in this manner chiefly that forest conservancy may be expected to mitigate the disastrous effects of seasons of drought and famine. The importation of grain can be facilitated by the construction of additional roads and railways, but cattle fodder cannot to the same extent be distributed over the country; it must either be produced on the spot in the vicinity of the villages, or the cattle must be driven away to places where pasture is available. The want of grass, and the consequent mortality among cattle, has always been one of the principal evils attending famines in the drier districts of India, and this evil can, in many cases, be mitigated by forest conservancy.

22. The lands in the immediate vicinity of well-stocked forests will have a more abundant, and at the same time a more permanent supply of timber, firewood, branches and thorns for fences, leaves for manure, and of cattle fodder, and they will have the advantage of heavier dew in the dry season, and of protection against dry scorching winds. And in most cases they will have a more certain supply of water in streams, springs, wells, and tanks. In this manner forest conservancy, if properly understood and methodically carried out, will improve the condition of the lands enclosed within and situated in the vicinity of the forests, and will thus promote the extension of cultivation.

23. The aim which should be steadily pursued in regard to the management of the waste and forest lands at the disposal of Government is to effect a sharp separation between fields, grazing grounds and forest. I do not advocate that the system of intermittent cultivation on dry lands, under which the fields are allowed to lie fallow for a number of years after a crop has been taken from them, should be discouraged. It is a necessity in many districts, and the fallows are useful grazing grounds. But there are cases in which this mode of husbandry can be improved upon, and a more intensive system of agriculture substituted. The cultivation in the Badaga villages on the Nílgiris is a case in point. At the present low rate of assessment (4 to 6 annas an acre) these people occupy large areas, and cultivate the lands on the slopes away from their villages with long fallows between. If these Badagas could be induced to adopt the system of building terraces, which enable the peasantry of the Himalaya to get excellent crops from the steep and rocky slopes of their hills, they would raise the same quantity of grain on a smaller area. I leave this subject, which in this place would lead me too far.

Grazing Grounds.

24. A more intensive management of the pasture lands is another subject which must be kept in view. Village grass preserves are an old institution in many parts of the North-West Himalaya. No grazing is permitted in those areas; they are carefully protected, and in autumn the grass is cut and stored. Without them the cattle could not be maintained during winter.

In most of the States in Rajputana extensive preserves of forest and brushwood are maintained according to ancient custom, either as the property of the State, like the Ramnas of Bhurtpore and Kishengurh, or as the property of the great nobles, who own a large portion of the land in Meywar. During the terrible famine of 1867 and 1868, while the cattle of the British districts of Ajmere and Merwara died or had to be sent away, these preserves in several of the Native States of Rajputana were of the greatest value in enabling the people to keep a portion of their cattle near their villages.

The care of pasture lands is not unknown in this Presidency. In the Coimbatore District there are 500,000 acres of occupied waste, for which assessment is paid by the ryots. These lands bear trees and shrubs and are used, partly to furnish firewood, partly for grazing and the cutting of grass. In the coast taluks of Nellore, the ryots pay assessment for large areas of wet and dry lands which they chiefly use for pasture.

In most districts of the Presidency, pasture on the Government waste lands is free, and in those districts where, as in Kistna and Nellore, grazing fees are levied on certain lands, free grazing grounds have been set aside, as far as possible in each village area, for the use of the ryots. I understand that it is intended to set apart free grazing lands in those districts also, which are now under settlement, *e.g.*, in Anantapúr, Bellary, and the Nílgiris. It appears to me to be a matter for consideration, whether this had not better be deferred until the selection of reserved forests is commenced. The two questions of improving the pasture and forest lands must be taken up together. Eventually it will probably be found convenient to set apart free grazing lands everywhere, if possible, but the selection of lands for forest purposes must not be made difficult by the previous allotment of free grazing grounds.

In seasons of drought pasture is available in the forest lands, when there is none in the open grazing grounds. It is not only that in such seasons there is more grass under the shelter of the trees, but the leaves of the trees themselves serve as fodder. In most cases it will be an advantage to get grazing grounds stocked with groups of trees. This, however, cannot be attempted on an adequate scale until forestry has advanced much further in this Presidency than it has at present. The growth of trees on grazing grounds, combined with closing them against cattle in rotation, and the establishment of grass preserves to furnish cut grass during the dry season, in which cattle will only graze after the grass has been cut and which will be protected against fire, these measures should eventually have a trial, and in the allotment of free grazing grounds nothing should be done to impede future action in this direction.

Forests.

25. But we must pass on to the immediate object of the present report, viz., to that portion of the lands at the disposal of Government which is to be maintained as forest.

Under the existing organization the greater portion of the Government forests in the hills, and a portion of those in the plains and the open country, are in charge of Forest Officers, and are subject to one set of rules; while some of the hill forests, and the greater portion of the jungle in the plains, are in charge of the officers of the Jungle Conservancy Fund, and are subject to another set of rules.

Thus all forests and jungles in the Nellore and Chingleput Districts, including the forests of Srîharikóta and those on the Kambakam and Nagalapuram hills, are under Jungle Conservancy Rules, and so are the jungles of Bellary and Anantapúr, whether situated on the hills or in the plains. In other districts, such as Cuddapah, South Arcot, and Madura, the jungles in certain taluks are under Forest Rules, and those in others are under Jungle Conservancy Rules. In North Arcot, South Arcot, and Trichinopoly, the District Forest Officer has charge of both classes of land, which are often contiguous to each other, but are nevertheless managed under separate rules and by separate establishments, although, in some cases, it has been found convenient to place contiguous Forest Reserves and Jungle Conservancy lands under one subordinate officer. There is nothing in the character of the two classes of lands to call for different rules and separate establishments.

26. It has been maintained that the difference lies in this, that the Jungle Conservancy lands are managed for the benefit of the villages, while the forests are managed for the benefit of the Imperial Revenue.

But the benefit derived by the Imperial revenues from the management of the forests in the Madras Presidency during the last ten years has been insignificant.

The following figures show that the total surplus revenue during the ten years ending with 1881-82 has only been Rs. 3,29,144. This takes no account of the general charges for pensions, furlough allowances and other matters with which all departments of the State must be debited :—

Years.	Receipts.	Charges.		Total.	Surplus.	Deficit.
		Conservancy works.	Establishments.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1872-73	4,18,767	3,03,735	1,74,412	4,78,147	..	59,380
1873-74	4,64,194	1,75,370	1,77,814	3,53,184	1,11,010	..
1874-75	3,64,326	2,21,864	1,76,008	3,97,872	..	33,546
1875-76	4,26,359	2,39,945	1,90,138	4,30,083	..	3,724
1876-77	4,15,312	1,94,943	2,19,027	4,13,970	1,342	..
1877-78	4,04,164	1,59,867	2,22,626	3,82,493	21,671	..
1878-79	3,83,694	1,24,406	2,17,398	3,41,804	41,890	..
1879-80	3,65,750	1,63,367	2,17,861	3,81,228	..	15,478
1880-81	5,01,839	1,32,206	2,19,798	3,52,004	1,49,835	..
1881-82	5,06,710	1,63,544	2,27,642	3,91,186	1,15,524	..
Total ..	42,51,115	18,79,247	20,42,724	39,21,971	4,41,272	1,12,128
Average ..	4,25,111	1,87,925	2,04,272	3,92,197	44,127	..

In future, for many years to come, forest administration, in the Madras Presidency, will require such heavy outlay for the organization of an efficient staff, for the constitution of reserved forests, and generally in order to enable the officers of the department to accomplish the task which is before them, in all districts of the Presidency, that it will be exceedingly difficult to make both ends meet, and to produce sufficient revenue to cover the outlay that must be incurred. As far as I am able to judge, forest administration in the Madras Presidency cannot, for many years to come, be expected to yield any surplus revenue.

The villagers have not derived any special benefits from the management of the Jungle Conservancy lands; they have grazed their cattle in them and collected firewood; they have done the same in the other waste lands as well as in most of the forests.

There is no difference, except in name and on paper, between these two classes of lands. If the village reserves of the Jungle Conservancy Fund are to do any good to the country, they must be managed, as they are in South Arcot, by professional Forest Officers, and their protection will require the same legal provisions as the protection of the forests.

27. These considerations induced the Forest Committee to urge, in their report of the 9th June, that the administration of these two classes of lands should be amalgamated, and this has been sanctioned by Government. The receipts and charges on account of Jungle Conservancy were formerly local, and it has now been decided that the entire amalgamated Forest and Jungle Conservancy revenue shall be provincial.

28. The following statement exhibits in a very rough manner the areas supposed to be under the control of Forest and Revenue Officers for the purposes of forest conservancy. The figures have been taken from a statement of forests and reserves dated the 1st September 1880, which was submitted to the Government of India in October 1880, and from the report by the Board of Revenue on the operations of the Jungle Conservancy Fund for 1880-81. The first column exhibits the estimated area of forest supposed to be under the control of Forest Officers, and the second the estimated area of jungles, topes and plantations managed by Revenue Officers, the revenue of which has hitherto constituted the Jungle Conservancy Fund.

Estimated Area of Land under Conservancy.

Districts.	State Forests and Reserves under Forest Officers.	Jungles, Plantations, and Topes under Revenue Officers.	Total.	Remarks.
	ACRES.	ACRES.	ACRES.	
Ganjam	372,320	6,445	378,765	
Vizagapatam	934,400	674,067	1,608,467	
Godávari	332,800	77 †	332,877	† The Jungle Conservancy lands do not appear in the annual report, though revenue is derived from them.
Kistna	..	566,105	566,105	
Bellary and Anantapúr	..	317,751	317,751	
Kurnool	832,000	201 §	832,201	§ The Yerramalais are not entered in the Jungle Conservancy Report for 1880-81.
Cuddapah	992,000	709,603	1,701,603	
Nellore	..	234,302	234,302	
North Arcot	422,400	43,241	465,641	
Chingleput	..	60,130	60,130	
Madras	..	..	..	
Salem	1,459,840	2,446	1,462,286	
South Arcot	458,240	206,920	665,160	
Trichinopoly	325,760	182	325,942	
Tanjore	..	10,637	10,637	
Madura	364,800	16,118	380,918	
Tinnevelly	357,760	24,756	382,516	
Coimbatore	736,000	822	736,822	
Malabar	46,720	..	46,720	
Nílgiris	287,360 ‖	..	287,360	‖ Includes 128,000 acres leased forest in Muddamalai, and the Benne teak forests, area 51,200 acres.
South Canara	160,000	552	160,552	
Total ..	8,082,400	2,874,355	10,956,755	

Note.—The areas are taken from the Statement of State Forests and Reserves of 1st September 1880, and from the Annual Report on Jungle Conservancy for 1880-81.

It was necessary in this report to quote these figures, as they are recorded in the public documents quoted, but they must not be taken for more than they are worth. In the Administration Report for 1880-81 (Statistical Return, page vii), the total area of pasture and forest lands in the Presidency is stated to be 5,400,000 acres. Obviously the value of such figures is limited.

Revenue derived from the Government Waste Lands.

29. Whatever measures may be taken for the improvement of these lands, arrangements must be made to secure a sufficient revenue from them to cover the cost of such measures. And it will be useful here to consider the revenue derived from them under existing arrangements.

In a subsequent chapter of this report an attempt will be found at framing a forecast of receipts on account of the amalgamated Forests and Jungle Conservancy, expected to be realized during the five years commencing with 1883-84.

From the following figures it will be seen that the rate calculated on the lands supposed to be under conservancy management varies from 0·72 annas to nearly 7 annas per acre. In these figures I have only included those districts with the circumstances of which I have had an opportunity of making myself personally acquainted. A column has been added showing the total area of land at the disposal of Government in these nine districts, opposite to the area supposed to be under forest conservancy. It will be noticed that the proportion of the latter in these districts varies from one-twelfth to three-fourths.

Districts.	Area of Land at the disposal of Government.	Area of Land under Forest and Jungle Conservancy.	Estimated Annual Receipts during the Five Years commencing with 1883-84.	Rate per Acre.
	ACRES.	ACRES.	RS.	ANNAS.
Bellary and Anantapúr ..	3,344,922	317,751	15,000	·75
Cuddapah	3,658,658	1,701,603	1,00,000	·94
Nellore	1,486,668	234,302	1,00,000	6·82
Chingleput	760,348	60,130	6,000	1·59
Salem	2,577,781	1,462,286	1,00,000	1·09
South Arcot	1,734,728	665,160	30,000	·72
Tinnevelly	928,542	382,516	40,000	1·67
Coimbatore	2,348,532	736,822	1,10,000	2·38
Nílgiris	347,643	287,360	60,000	3·34

30. The figures entered in the preceding statement comprise those items of revenue only which under existing practice are credited either to "Forests" or to "Jungle Conservancy." But there are other items which are derived partly from forest lands, partly from other waste lands which are at present credited to "Land Revenue Miscellaneous." The figures have been taken from the Jamabandi Reports for Faslis 1289 and 1290, submitted to the Government of Madras by the Board of Revenue.

Items of Revenue.	Fasli 1288.	Fasli 1289.	Fasli 1290.	Remarks.
	RS.	RS.	RS.	
1. Tax on trees on unassessed lands	1,22,063	1,16,012	1,17,130	Chiefly tamarind, palmyras, ippi, and mangoes.
2. Grazing tax or grass rent	97,903	94,259	94,377	Nellore and Kistna.
3. Rent on palmyra trees	70,283	69,348	69,173	
4. Rent on fruit trees	12,731	12,769	10,822	
Total ..	3,02,980	2,92,388	2,91,502	

I have omitted several minor items of insignificant amount, such as honey, wax, cardamom, and soapnut rent. Orders have lately been passed directing the grazing tax of Kistna to be credited to Jungle Conservancy, and it is for consideration whether any other of the items quoted should not be credited to "Forests."

31. The Forest revenue and the items just named do not, however, constitute the whole income derived by Government from the 32 millions of acres of unoccupied land at their disposal. A considerable revenue is realized from cultivation in unoccupied Government lands, of which the following are the chief items :—

Items.	Fasli 1288.	Fasli 1289.	Fasli 1290.
	RS.	RS.	RS.
1. Land cultivated without durkhast, for which no pattas have been granted	73,495	84,852	89,480
2. Cultivation of poramboke lands	1,03,712	88,748	88,747
3. Cultivation of jungle lands newly cleared by burning in South Canara	19,853	6,175	7,680
Total ..	1,97,060	1,79,775	1,85,907

32. There is also an annual income from the sale of waste lands and the sale of trees. In the two years named the revenue from these sources was as follows:—

Items.	Fasli 1288.	Fasli 1289.	Fasli 1290.
	RS.	RS.	RS.
Sale proceeds of waste land ..	67,273	56,675	26,454
Sale proceeds of trees	3,552	3,988	6,251
Total ..	70,825	60,663	32,705

33. Lastly a considerable portion of the excise revenue is derived from the unoccupied lands at the disposal of Government, in the following manner:—The amounts paid by toddy-renters give them the right to the use of all toddy-bearing trees on Government waste lands, and the same privilege is allowed to arrack-renters when arrack is distilled from toddy. Hence a portion of the revenue derived from arrack and toddy represents the produce of lands at the disposal of Government. The total amounts realized on this account in 1877-78 were as follows:—

	RS.
Toddy	22,00,000
Arrack	37,50,000
Total ...	59,50,000

34. It may perhaps be assumed that one-sixth of this, or say 10 lakhs, represents the excise revenue derived from unoccupied land at the disposal of Government, and that of the other items now credited as "Land Revenue Miscellaneous" 5 lakhs are derived from the same classes of lands. Making this assumption, the total annual revenue due to these 32 million acres of Government waste would be—

	RS.
Forest and Jungle Conservancy (Forecast)	9,00,000
Share of Excise	10,00,000
Revenue now credited to "Land Revenue Miscellaneous" ...	5,00,000
Total ...	24,00,000

amounting to 1·2 annas per acre.

The practical object of putting forward these figures is to show what amounts can fairly be held to be available for the improvement of the unoccupied lands at the disposal of Government. It has been shown above that about 11 millions of acres are supposed to be under forest conservancy management. Assuming that an equal area is required for pasture, and that 10 millions remain for the extension of cultivation, it might be said that an annual revenue of 24 lakhs is available for the protection and improvement of 22 million acres of forest and pasture lands. But it is not my intention to propose that one-sixth part of the excise revenue, and 5 lakhs now credited to "Land Revenue Miscellaneous" should be credited to "Forests." It would not, however, be unreasonable to transfer items aggregating, say, Rs. 1,00,000 from "Land Revenue Miscellaneous" to "Forests." If this were done, an annual income of 0·8 annas per acre would be available for the protection and improvement of 22 millions of acres of forest and grazing grounds.

Improvement of Forests.

35. The question which stands next for discussion is, what shall be done in order to improve the condition of the lands now under conservancy management. For this purpose it really is immaterial whether the area is 11 millions of acres, the figure entered in the statement in paragraph 28, or is more or less.

The object to be attained by the good management of these lands is to provide wood, timber, and other forest produce for the agricultural population, for towns, railways, and other requirements, and to secure to the country certain indirect advantages which it is believed will result from the protection of forests.

36. Following the arrangement of the Act, I shall deal with this subject under the three heads of reserved forests, lands at the disposal of Government not included within reserved forests, and, lands not at the disposal of Government or in which Government has a limited right.

The two measures which most urgently claim the attention of Government at the present time are the formation, protection and improvement of reserved forests, and the good management of the lands at the disposal of Government not included within reserved forests.

Reserved Forests.

37. Regarding reserved forests the only point that need be fixed at present is that they must be maintained and managed as forests. They may be managed by the State Forest Officers, or it may be feasible hereafter to place some of them in charge of the village officers, and to constitute them village forests. All this is immaterial, as long as they are maintained as forest and are made to fulfil the object, for the attainment of which they were formed.

Their selection.

In the suggestions which I have submitted in the chapters relating to those districts which I have been permitted to visit, the general questions of forest policy are discussed, with special reference to the requirements of those districts. I am most unwilling to burden the present report with discussions on general subjects, yet it may be useful to submit a few general observations.

As regards the total area which should be included within reserved forests, I do not attempt to offer any definite suggestions. We cannot make a calculation, with any hope of practical usefulness, based upon population, estimated fuel consumption per head, or other data, of the total area of reserved forest that will be required in any particular district. This must settle itself gradually as the result of practical considerations. The constitution of reserved forests, and the settlement of the rights of the State and of other persons in these lands will necessarily be a protracted business, and my advice is, in each district to take in hand those areas, the protection of which is most urgently required. There are in each district certain pressing requirements, which necessitate the demarcation of certain areas of reserved forest. Let these pressing requirements be satisfied first, and when this has been accomplished, consider whether anything more is required to place forest management in the district upon a satisfactory footing.

38. Thus in Tinnevelly, we hold that extensive areas on the ghâts must be maintained as forest, in order to secure a permanent water-supply to the rivers for irrigation; in the northern part of Chingleput and in the Nellore District, a certain area of forest must be maintained to provide a portion of the fuel supply to the town of Madras; in Salem, the maintenance and development of the iron industry claims our early attention; in Bellary, reserves must be formed to secure a permanent supply of fuel to the town, to cotton presses, to the new railway, and for iron smelting and sugar boiling; in the three districts of Cuddapah, North Arcot, and Salem, it will probably be necessary to demarcate as large an area as possible, within practicable distance from the railway line, for the supply of locomotive fuel; in Coimbatore, the Ánaimalai forests must be constituted reserved forests under the Act, in order to furnish a permanent supply of large timber; and the head of the Bolampatti valley must be placed under protection in order to maintain the water-supply in the Nóyil river, upon which the irrigation in the Coimbatore and Palladam Taluks mainly depends.

39. It may be useful to state that, according to the information which I have been able to collect, the following projects appear to me to be the most urgent:—

First.—The head of the Bolampatti valley and the hills which enclose it, the object being to protect the water-supply of the Nóyil river.

Second.—That portion of the Ánaimalai range, in the Coimbatore District, which is drained by the feeders of the Amarávati river, and the hills in the Palni taluk of Madura, which are drained by the Shanmuganadi, and by other tributaries of the Amarávati.

Third.—The Ánaimalai teak forests.

Fourth.—The ghâts in the Tinnevelly District, as far as they are at the disposal of Government, in order to protect the head-waters of the Támbraparni and other rivers in that district.

Fifth.—The forests and waste lands capable of producing fuel in the vicinity of the Madras Railway in the Cuddapah, North Arcot, Salem, and Coimbatore Districts, in order to ensure an adequate fuel-supply for the working of the line.

Sixth.—The hills between Anantapúr and Tadpatri in the Anantapúr District, for the production of fuel and building-wood.

Seventh.—The Government waste and jungle surrounding the leased forests of Sandúr and the hills in the Hospet, Kúdligi, and Ráyadrug taluks of the Bellary District, for the production of fuel, charcoal for iron-smelting, and cattle-fodder.

Eighth.—Certain hills in the vicinity of Cuddapah, and the Jammalamadugu hills in the Cuddapah District, for the production of wood and cattle-fodder.

Ninth.—Belts of grass-land and sholas on the Nílgiri plateau, on the crest and higher slopes of the main ridges, to be strictly protected against fire, and to be partially and gradually planted up, in order to afford shelter against winds, to improve the condition of the lands below them, to furnish wood and timber, and to improve the water-supply in springs.

I am disposed to suggest that the Bolampatti forests in Coimbatore, the reserves proposed to be formed on the Nílgiri plateau, and the lands indicated in the Bellary District be taken in hand first of all.

Settlement.

40. The selection of the areas, and the preliminary definition of the boundaries, must be made by a Forest Officer, whose duty it will be, in communication with the local Civil Officers, to ascertain that the areas selected are really at the disposal of Government, and to prepare a preliminary statement of the lands which must be acquired in order to secure good boundaries, and of the rights in the areas selected, which must be dealt with by the Forest Settlement Officer. The duties of the Forest Settlement Officer are clearly defined in the Act, and it is not necessary to explain them in the present report. It is essential that the Forest Settlement Officer should commence his inquiries immediately after the selection and preliminary inquiry by the Forest Officer has been completed, and that the officer who has made the selection and the preliminary inquiry should also assist the Forest Settlement Officer in his work.

41. The last stage in the procedure is the issue of a notification, under Section 16 of the Act, declaring the area a reserved forest.

The legal consequences under the Act of this notification are as follows :—

Section 17.—Rights not claimed are extinguished.

Section 18.—No fresh rights can accrue; the grant of pattas, without the previous sanction of the Governor in Council, is prohibited, and every patta granted without such sanction is null and void.

Section 19.—No rights admitted may be alienated, save with the estate to which they appertain, or otherwise by the special sanction of Government. No forest produce obtained in exercise of any right admitted under the Act may be sold or bartered, except to the extent defined by the order admitting the right.

Section 20.—Roads and water-courses may be altered by Government.

Section 21.—Certain acts which interfere with the protection and good management of the forest become penal.

Section 22.—The exercise of rights may be suspended whenever the forest has been fired by persons exercising rights in the forest.

Section 23.—Rightholders and persons permitted to use the produce of a reserved forest, or persons employed by Government in the vicinity of a reserved forest, are bound to give information and assistance.

42. After considering the circumstances of this Presidency, I have come to the conclusion that, under the existing provisions of the Forest Act, the constitution of reserved forests will be a protracted and costly business, which will extend over a long series of years.

It may be objected that, in the provinces under the Government of India, the settlement of reserved forests has been accomplished in a more expeditious manner than is anticipated in the Madras Presidency. This objection may be admitted; but it must be borne in mind that in those provinces where this work has been accomplished expeditiously, and where it is still progressing in a satisfactory manner, the rights of Government in the waste land had been clearly defined and recorded at the Land Revenue Settlement. Thus, in the Central Provinces, in Government villages, a certain area of waste and forest was, at the time of settlement, allotted to the Malguzars, in addition to the cultivated lands, while the excess waste was declared the absolute property of Government. Obviously, under these circumstances, the settlement and demarcation of the reserved forests in the Central Provinces was a comparatively easy matter.

In the Madras Presidency circumstances are different, and the business must necessarily be protracted.

43. It might also be urged that large areas of land at the disposal of Government are every day alienated, either under the ordinary durkhast rules, or under the waste-land sale rules, and that this is done in a summary and expeditious manner. No formal procedure is prescribed for inviting claims previous to the sale of such land, and practically it is left to the Revenue Officers to ascertain the existence of any rights incompatible with the alienation of the land.

In alienating land under the waste-land sale rules, it is true that Government does not sell more than its own rights in the land, but practically the purchaser becomes absolute proprietor. He holds his land, subject to the existing and customary rights of Government and other persons, in existing roads and paths, and in streams running through or bounding his land, which are expressly mentioned (paragraph 20 of Board's Standing Order 34), but no purchaser under the waste-land sale rules would tolerate the exercise, by the adjoining villages, of rights of pasture, or rights to wood and timber on his land. Formally these rights are not extinguished, but as a matter of fact they disappear.

The inference is that in forests and waste lands, such as are ordinarily sold under the waste-land sale rules, the adjoining villages can exercise rights of user only so long as these lands are not allotted by the Government for cultivation, or required for other purposes.

Apart from the Forest Act therefore, the right of Government to constitute selected areas as reserved forests appears undoubted, and at first sight it may seem anomalous that the constitution of reserved forests for the public benefit should require a more protracted procedure than the alienation of land to private persons under the waste-land sale rules. The difference however is this, that reserved forests are legally placed upon a footing different from lands which, under the waste-land sale rules, are constituted private property. Whether the difference is so great as to necessitate the procedure prescribed by the Act for the settlement of reserved forests, is a question of general policy, into which I do not propose to enter.

Demarcation.

44. After land has been declared a reserved forest, the boundaries must be demarcated by boundary marks, cleared lines, fences, ditches, or otherwise. Under existing orders the demarcation has hitherto been done by the Revenue Survey, and the Superintendent is of opinion that this practice should be maintained.

Colonel Rogers has informed me that the planting of the boundary marks was formerly done by other departments, but that this was found so unsatisfactory for many purposes that the present practice was established. In the provinces under the Government of India the demarcation of reserved forests is done by Forest Officers, and I am disposed to think that, after the officers of the Madras Forest Department have learnt fully to appreciate the necessity of good boundary lines, it will be found more convenient to adopt this practice. The boundaries of reserved forests should,

when they do not follow a permanent road, a river, or other given line in the plains, consist as much as possible of long straight lines; and in the hills they should adapt themselves to the configuration of the country. In all cases they should have as few angles as possible, and unless marked by a continuous fence or ditch, there should be a conspicuous boundary mark at every angle. This is necessary to facilitate the protection of the forests as well as for purposes of survey. The boundaries of reserved forests must be conspicuous; it is only fair and just to the people residing in the vicinity that these lines should be clearly marked on the ground. Eventually I have no doubt that the officer who has made the preliminary selection, and who has assisted the Forest Settlement Officer in the settlement of rights, should be charged with the demarcation of the area after it has been constituted a reserved forest. Skilful demarcation saves time, temper, labor, and expense.

Reserves sanctioned before the passing of the Act.

45. Certain areas have already been sanctioned as reserved forests. Under Section 25 such areas may be declared reserved forests under the Act, provided that, if the rights of Government and private persons in such lands have not been inquired into, settled and recorded, in a manner which the Government thinks sufficient, the procedure prescribed by the Act must be applied.

The following is an abstract statement exhibiting the area of lands sanctioned as reserved forests by the orders of the Government, or the Board of Revenue, up to the 1st January 1882, with date and No. of the orders passed thereon. It will be noticed that the estimated area of these so-called reserves aggregates 756,563 acres, but it is by no means certain that the whole of these lands can be declared reserved forests under Section 25 of the Act. Much of this area has never been demarcated, nor have the rights of third persons been sufficiently inquired into. The point for decision in this matter is whether the inquiry held previous to the constitution of each reserve was sufficient to be accepted as equivalent to an inquiry held under the Act, and this question must, in each case, be decided by Government. I suggest that it be made the duty of the Settlement Officers, to be appointed under the Act, to examine, in company with the Conservator and the local officers, the records regarding each of these so-called reserved forests and to submit proposals regarding them to Government:—

Districts.	Estimated Area in Acres.	Orders by Government and the Board of Revenue.	Remarks.
Godávari	43,520	G.O., No. 792, dated 10th July 1880. ,, ,, 1107, ,, 8th Sept. ,,	
Cuddapah	113,286	G.O., No. 1974, dated 13th June 1877. ,, ,, 672, ,, 7th May 1878. ,, ,, 1832, ,, 29th Nov. 1881. Revenue Board, No. 7015, dated 8th Dec. 1870.	
North Arcot	14,381	G.O., No. 971, dated 1st June 1871. ,, ,, 820, ,, 9th April 1879. ,, ,, 1798, ,, 30th Aug. 1879.	
South Arcot	95,757	G.O., No. 4, dated 4th April 1874. ,, ,, 1346, ,, 19th Oct. ,, ,, ,, 1189, ,, 29th July 1878. ,, ,, 1023, ,, 26th Aug. 1880. Revenue Board, No. 6512, dated 31st Aug. 1869.	
Trichinopoly	4,166	G.O., No. 502, dated 21st March 1871.	The No. and date of the order constituting the Tuvakudi block a reserve is not given in the returns received.
		,, ,, 1064, ,, 15th June ,, ...	
Madura	150,675	G.O., No. 1681, dated 17th Oct. 1878. ,, ,, 1284, ,, 29th Aug. 1881.	
Tinnevelly	183,558	G.O., No. 257, dated 11th Feb. 1881.	
Coimbatore	92,941	G.O., No. 1612, dated 2nd Aug. 1879.	
Nílgiris	18,074	G.O., No. 2247, dated 5th Dec. 1879. ,, ,, 82, ,, 16th Jan. 1878. ,, ,, 110, ,, 29th ,, 1880.	
Salem	11,398	G.O., No. ——, dated 15th Jan. 1867	The orders constituting the reserves are not given in every instance.
		,, ,, 190, ,, 16th Feb. 1880	
		,, ,, 270, ,, 2nd March ,, ...	
Malabar. Pálghat ..	13,248	G.O., No. 1445, dated 18th Oct. 1872.	
Nilambúr ..	15,558	,, ,, 1261, ,, 3rd ,, 1874.	Leased and purchased.
	756,563	....	

The Board of Revenue, in submitting to Government the Conservator's report for 1881-82, state that this area had been reserved. This expression however is apt to mislead. Apart from the Forest Act, the meaning of the term "Reserved Forest" is, that the area included in it is reserved from alienation. But as a matter of fact it cannot be said that any of the area included in this statement has been reserved in this sense of the word. A portion only (228,441 acres, as reported by the Conservator of Forests in his letter to Government, dated the 2nd November 1882) has its boundaries demarcated; and in these demarcated areas also there is, under existing circumstances, no security that squatters will not settle and that pattas will not be granted. The question which of these areas can be constituted reserved forests under the Act should be taken up without delay.

Maps.

46. I assume that the work of preparing maps of the forests in this Presidency will continue to be entrusted to the Madras Revenue Survey.

Eventually when the work of demarcating reserved forests under the Act has made progress, and when blocks and compartments have been formed, it may be found advantageous to ask the Government of India for an officer of the Forest Survey, to be employed under the Superintendent of Revenue Survey, Madras, specially for the survey of reserved forests. Another arrangement would be to send one of the junior passed officers to the Forest Survey to qualify in surveying by the higher standard, and after having worked under Major Bailey for some time to return to this Presidency. For though the operations of the Forest Survey in a great measure resemble those of a survey for other purposes, still they have some important features and difficulties of their own, and the experience gained by the Forest Survey, in surveying forest tracts and in preparing maps to suit the requirements of Forest Officers, has gradually developed a certain system and practice which may hereafter be adopted with advantage in the survey of the Madras forests.

47. As the Revenue Survey and the Topographical Survey of tracts excluded from the Revenue Survey in this Presidency progresses, the Government forests comprised in such tracts will be surveyed in due course. Special arrangements should, in my opinion, as a rule, only be made in the case of those forests which have been constituted reserved forests under the Act, and the boundaries of which have been completely demarcated on the ground, either by ditches, by cleared lines, or by substantial boundary marks. There are cases in which the selection of boundaries for reserved forests is greatly facilitated by detailed topographical maps, but such cases are rare.

48. The scale of forest maps must depend upon circumstances. In regard to this subject I cannot do better than quote the following paragraphs of a memorandum which I submitted to Government on the 1st March 1879, and which is recorded in G.O., No. 970, dated the 1st May 1879 :—

"I understand that the preparation of forest maps is under consideration in the Madras Presidency, and that it has been proposed to have two classes of maps on different scales for each forest, viz., one on the scale of 1 inch to the mile for general reference, and one on the scale of 4 inches to the mile for full details. In many cases, this will, doubtless, be a convenient arrangement, but I would beg strongly to urge that no hard and fast rule be laid down regarding the scale of forest maps, as this must in each case be regulated by the character of the forest and by other circumstances. I may, perhaps, be permitted to illustrate my meaning by a reference to the maps of certain forest districts which I have lately had the privilege of examining.

"For some of the hill forests which are attached to the Forest School Circle of the North-Western Provinces, maps on the scale of 4 inches to the mile have been prepared, and I have lately satisfied myself, in examining some of these forests by compartments, with the map in hand, that in these forests it would be impracticable to work with maps on a smaller scale. These forests are used to provide for the requirements of railways in the matter of sleepers and of the military stations of Chakrata in the matter of fuel, charcoal, and timber. They must be managed in detail, the treatment of each compartment varying according to soil, aspect and steepness of the slope, and the character of the growing stock.

"These forests I examined in November; and in December I spent some time in the inspection of the reserves formed a few years ago in Ajmere and Merwara. In these forests protection is now the main work, and must be so for many years to come, and consequently

maps on a smaller scale are sufficient for all present requirements. They are on the scale of 1 inch to the mile, and these maps I found amply sufficient for all present purposes, although these forests are situated on broken hilly ground."

49. It should be borne in mind that maps, and particularly large scale maps, are expensive, and the aim should be to work with existing maps as long as possible, supplementing them, whenever necessary, by carefully executed sketch maps. In India the usefulness of sketch maps, based upon eye survey, with the aid of such instruments as can conveniently be used for rapid work, is particularly great, and the art of making useful sketch maps should be cultivated by Forest Officers in this Presidency. As the work progresses, and actual necessity arises, more detailed maps must be prepared. Plantations and forests which require intensive working demand maps on a large scale. Thus it will be seen on reference to paragraph 299 of my report on the Forests of the North-Western Provinces and Oudh of the 1st November 1881, that for one block of the hill forest mentioned above, which had been surveyed on the scale of 4 inches to the mile, it has since become necessary to prepare a map on the scale of 16 inches to the mile. And eventually portions of the reserves in Ajmere and Merwara will doubtless require maps on a larger scale than 1 inch to 1 mile.

50. In cases where the boundaries of forests have not been demarcated, the scale must ordinarily be that selected for the tracts of country in which the forests are included, and if subsequently, after the forests have been constituted reserved forests under the Act, and the boundaries have been duly demarcated on the ground, maps on a larger scale should become necessary, then special arrangements must be made.

In the case of reserved forests constituted under the Act, the scale must, as explained, depend upon circumstances. For forests where protection is expected to be the main work for a long time to come, a smaller scale is sufficient than in the case of forests which are to be worked intensively, which have been divided into blocks and compartments, and where regular cuttings and cultural operations are proposed to be undertaken.

51. Regarding the detail to be entered on forest maps, they must show the boundary of the forest, boundary pillars, the topographical features of the ground, made roads, permanent cart-tracks and foot-paths, bridges, streams, canals, villages, wells, and land-marks such as rocks, clumps of trees and the like, rest-houses, Foresters' huts, timber depôts, and where boundary marks have serial numbers, such numbers ought to be entered on the map. The boundaries of civil districts and village areas, and, where a settlement of rights has been made, the limits of the areas assigned for the exercise of rights should be indicated. Whenever blocks and compartments have been demarcated on the ground, their boundaries, and the names, letters and numbers by which these blocks and compartments are designated must be shown on the map. The height above the sea level should be entered at as many points as possible; this has been done on some of the Madras forest maps which I have examined, and adds much to their usefulness.

The hill shading should be as light as possible, and the mode in which hills are indicated by open contour lines on the maps of the Cuddapah reserves is very good. The Forest Survey under the Government of India find blue prints very suitable. On this subject, and on the necessity of hill shading on forest maps, I give a communication received from Mr. E. E. Fernandez, Superintendent of Working Plans, in which he states his experience regarding the hill shading on forest maps while engaged, in company with Mr. A. F. Broun, on the valuation surveys of certain hilly forest tracts in the North-West Provinces :—

"In the steep and rugged hills of the Nandhaur valley, had we had no maps showing the topography, I do not hesitate to say that our work would have been impossible, or at least would have taken six instead of two winter seasons to complete. For one of the upper portions of the valley there was only a tracing of the outlines available, and the difference we found between tramping about and laying out boundaries of enumeration survey plots and examining the growth in that part and doing the same in those parts for which we had printed maps was very striking.

"In all these forests, viz :—Ranikhet, Naini Tal and the Nandhaur valley, my practice was to mark out plot-boundaries on the map after a general view of a whole or several hillsides from

some commanding position. The boundaries were then correctly marked out on the ground by any apprentice or recorder furnished with a map showing them. Had there been no hill shading, Mr. Broun or myself would have had to mark out personally nearly every boundary, which would, moreover, in many cases have had to be surveyed in order to be entered on the map. With the topography correctly shown on our maps, we were saved this enormous trouble and waste of time.

"To those who object that the representation of the hills in a map crowds it with lines which prevent notes being made on it, or lines representing other features being marked on it, I reply that light blue prints possess none of these disadvantages. My work at Naini Tal was done entirely with such prints, and, as far as entering notes, new roads, plot-boundaries, &c., in a clear manner was concerned, they were almost as good as blank paper. The contours of the hills and valleys are more conspicuous when drawn in black, but the blue prints, after a very little use, convey at once quite as accurate an idea of the topography as the black ones would do.

"In the Nandhaur valley I had blue prints of the lower half of the valley and black ones of the greater portion of the upper half. There was no doubt for a single moment as to which of the two sets of prints was better.

"For field work in a hilly country, I would invariably prefer light blue prints to any other."

In forest maps the greatest care must be used in entering the correct names of streams, hills, and other localities, as they are known and named by the people of the country. All well-defined ridges, peaks, and valleys should be named; also remarkable masses of rock, as far as they have recognized names. Topographical maps are often very deficient in this respect. This is one of the points to which special attention is paid by the Forest Survey.

52. The printed forest maps should not, as a rule, contain matters of a temporary character, such as the description of the timber or other growing stock, whether natural or planted, the age of plantations, areas of plantings and fellings. Whenever required in the course of the work, such information must be entered by hand on printed copies of the maps. There are cases in which the character of the vegetation depends upon the character and level of the soil. A marked instance are the alternating belts of sál forest on high ground, and of khair (*Acacia Catechu*) and sissoo (*Dalbergia Sissoo*) forest on boulder beds in the rivers, and on stretches of low ground at the foot of the Himalaya.

But such instances are rare, and in this Presidency, I do not know of any instance in which the character of the forest might with advantage be entered on the printed maps. Open grass-lands and permanent fields may, however, often with advantage be entered on the map.

53. It has been suggested in this Presidency that the nature of the rock, of the soil or sub-soil, should be shown on forest maps. Though this is a permanent feature it would not be convenient to enter it on the printed maps. The examination of the rocks and soil, if the result is to be of any value, would require special knowledge, which the surveyor cannot generally be expected to possess; it would also require a great deal of time, it would delay the completion of the maps and would obscure the drawing on them.

In the ordinary course of work, forest maps are used in the same way as maps are used for other purposes. Their special use for the forester is, to enable him from time to time to record (by hand), on copies of these maps, the progress of operations in the forest, and to illustrate the plan proposed for working them. For this purpose signs and colors to indicate the description and age of forest are needed, but they should not, as a rule, be entered on the printed map. On the contrary the drawing of the printed maps should be as open as possible, so as to make it easy to add entries by hand afterwards, as circumstances may arise.

54. Hereafter, when forest work has progressed in this Presidency much more than it has at present, and when regular working plans come to be framed, printed maps will be required to illustrate such working plans, showing the description of forest, and the gradation of ages existing and that proposed to be attained; but these are not among the necessary requirements at the present time.

What are now required, are plain but accurate maps, so drawn as to be convenient for the use of the forester.

When special maps of reserves are prepared, the leading features of the surrounding country, such as rivers, roads, and the sites of villages should be shown.

It is better still to show all topographical detail for some distance beyond the boundary,—say half a mile.

Village Forests.

55. The orders of the Government of Madras of the 17th September 1875, conveying instructions to a Committee, appointed for the preparation of a draft Forest Bill, stated that an Act was required which should deal separately with forests under the head of State Forests, Communal Forests, and Proprietary Forests.

In their Proceedings of the 5th August 1871 the Board of Revenue wrote as follows:—

"There is scarcely a forest in the whole of the Presidency of Madras which is not within the limits of some village, and there is not one in which, so far as the Board can ascertain, the State asserted any rights of property—unless royalties in teak, sandalwood, cardamoms, and the like, can be considered as such—until very recently. All of them, without exception, are subject to tribal or communal rights which have existed from time immemorial and which are as difficult to define and value as they are necessary to the rural population. * * * Here the forests are, and always have been, common property."

These views were endorsed by the Government of Madras in a communication to the Government of India of the 23rd December 1876, as representing the position of the rural population regarding the forests of the Madras Presidency. Circumstances, however, have changed; it is now recognized that there are no Communal Forests as distinct from State Forests in the Presidency of Madras.

56. In paragraph 4 of their report, dated the 10th June 1882, the Committee appointed by Government to frame the Forest Bill stated their deliberate opinion, that there are no Communal Forests in this Presidency, and I may add, as the result of the enquiries made by me in the districts through which I have marched, that I have not been able to discover any facts indicating the existence of Communal Forests. The villagers are in the habit of collecting firewood, thorns for fences, and of pasturing their cattle on, driving them across, and themselves passing over waste lands, so long as these are not required by the Government for cultivation or other purposes; and to this extent they may be said to exercise rights of pasture or other rights of user in the waste and forest lands included in their village areas, but this is nothing else than what we find in public forests of all countries. Such rights of user are vastly different from proprietary rights, and their existence does not constitute the forests in which they are exercised Communal Forests.

57. A practice exists in the South Arcot, and in several other of the southern districts, under which the members of the village community hold pattas for fruit-trees, fisheries, and grass-beds for thatching in common (*Samudayam pattas*); but Communal Forests, in the sense in which the word is understood on the Continent of Europe, do not, so far as I am aware, exist in this Presidency. The District Forest Committees, which, under the orders of Government, selected reserves in the Coimbatore, Madura and Tinnevelly Districts, from 1878 to 1880, and enquired into the rights existing in these forests, have stated their opinion that there are no communal rights in the reserves selected by them, and it is now generally acknowledged that there is no communal proprietorship in forests in the Presidency.

Under these circumstances no provisions concerning Communal Forests were required in the Act.

58. It is a different question whether the Act ought not to contain provisions giving power to form Village Forests. Both the Indian and Burma Forest Acts have a chapter relating to village forests. The Indian Act gives power to the Local Government to assign to any village community the rights of Government over any land which has been constituted a reserved forest. The Burma Act empowers the Chief Commissioner to constitute any land at the disposal of Government a village forest, for the benefit of any village community, or group of village communities. The chapters in these two Acts are of a prospective character. They have been framed in order to enable Government eventually to arrange for the protection and management of forest and waste lands, which shall yield a

permanent supply of wood and fodder to villages, without any expense to the State.

I have no doubt that these village forests will eventually be established in many districts in the provinces under the Government of India, and that, if well managed, they will contribute much to the healthy development of municipal institutions and local self-government.

59. A glance at the area statement appended to the present report, and at the forecast of annual forest revenue recorded in a subsequent chapter will show that it will be quite impossible for the State to provide the means for the protection and improvement of the whole of the waste lands at its disposal. It has been shown in paragraph 34 that the forest revenue expected during the next five years will not provide more than 0·8 annas per acre annually for 22 million acres of forest and pasture lands. Certain proposals are, it is true, submitted in this report which will have the effect of eventually increasing this revenue. But so much is certain, that financially it is out of the question for the State to undertake the task of efficiently protecting and steadily improving the whole of the forests and grazing grounds. All that Government can undertake at the outset, is to take in hand certain selected areas, the protection of which is required for certain special purposes, to constitute them reserved forests, and by good management to bring them to such a state of productiveness as to make them pay their way, and, in the case of tracts favorably situated, to yield a surplus revenue, which, however, for many years to come will be absorbed by other tracts which are poor, and which cannot yield any surplus revenue.

This state of things is not peculiar to the Presidency of Madras; it exists in all provinces. Hence the plan has arisen to form village forests, which will include the village grazing grounds, and which it is intended shall be protected and managed by the people, yielding to them a permanent supply of wood and fodder without any expense to the State.

60. Considerations similar to these led me, as long ago as May 1868, to recommend, as the result of an examination of the forests in the Mysore State, that, as an experiment, a system of village forests should be established in some of the eastern districts. The nature of my proposals will be seen from the following extracts from my report:—

"I have the honor to submit, for the Commissioner's consideration, a memorandum which I have drawn up on the subject of establishing village forests.

"2. The proposals embodied in this paper attempt to deal with a very important question, viz., the better utilization of the waste and unculturable lands which, I suppose, form much more than one-half of the village areas in Mysore.

"3. I believe that, under careful and methodical management, much may be done to supply the requirements of the agricultural population more abundantly, both in the matter of the grazing of cattle, and in the supply of timber, wood and bamboos.

"4. As far as I have had opportunities of judging, the art of agriculture in Mysore is further advanced than in many other parts of India; great attention is paid to the supply of water, to manuring, to the working of the ground, and to some extent, also, to a rotation of crops; it does not therefore seem unreasonable to expect, that the ryots may be brought to advance another step, and in the management of these grazing grounds and jungle lands, to adopt a regular system of rotation, which, with a few other measures, will do much to make those lands more productive.

"5. The first step in this direction appears to be to assign to villages and groups of villages the needful extent of grazing and forest lands, together with all the revenue hitherto derived from these lands by the State. But this alone will be ineffectual to secure the objects aimed at, if, at the same time, some agency is not established to carry out these improvements in an effectual manner.

"6. The question may be raised, whether it would not be sufficient to trust to the moral and other influence which may be brought to bear upon the patels of villages by the ordinary Revenue Officers of the country.

"Something, it is true, might be effected in some cases by persuasion, in others by an order from the Chief Revenue Officer of the district. I doubt, however, whether this would be sufficient to secure throughout that methodical management of their lands which is required to secure the success of the scheme.

"7. On the other hand, if the present proposals are adopted, success will to a great extent depend on the hearty co-operation of the Revenue Officers with those of the Forest Department.

"8. The Commissioner will observe that my proposal is, in the first instance, to introduce the system of village forests as an experiment only in a small part of the country. This

limitation of the scheme is necessary for other reasons, and also because a sufficient number of Forest Officers of such experience as to be usefully employed in a work of this kind is not likely to be available.

"9. I have had the privilege of discussing the present proposals with several Revenue Officers, but as the line of my journey has generally been far away from stations, I have had less opportunities for doing so than I might have wished; and I would suggest, as the first step to be taken in this matter, that my report be circulated among all Revenue Officers of Mysore, and that they be requested to express their views regarding it, fully and without reserve.

"ON THE FORMATION OF VILLAGE FORESTS IN MYSORE.

"*Introduction.*—The existing rules under which those Government forests are managed which are generally called "unreserved," because they have not been reserved as State Forests, cannot be said to secure their conservancy. It is true that they secure a certain revenue from these forests and protect certain reserved kinds of wood, and, in some cases, guard against waste; but they can hardly be said to do more. On the other hand, some of their provisions are complained of as irksome in the more thickly wooded parts of the country.

"Now, Mysore is thus situated:—one part of the country, the belt which stretches along its western boundary, abounds with jungle; whereas, a large part of the eastern and central portion is very thinly wooded, the only resources being low scrub on the hills, wild date [*eetchal*] jungles in certain parts, and trees on fields, in avenues, groves and gardens, some taluks being almost or entirely bare of arborescent vegetation.

"2. *Objections to Forest conservancy in Mysore.*—For the western portion, or the Mulnaad, it might be said that no forest conservancy is required, as forest produce is of little value; and for the eastern part of the country that no forest conservancy is possible because there are no forests. If this were the correct view of the question, we might then be satisfied with the reservation as State forests of those wooded tracts which are required for special purposes, such as providing the country at large with timber and wood, furnishing large towns and mining districts and the railways with fuel, and in certain tracts protecting the country against the evil effects of denudation. In that case, the present rules for the unreserved forests might remain in force, modified only so far as to render their application less irksome to the inhabitants.

"3. *Village Forests in the intermediate belt of country.*—But the survey of that large belt of country which extends from north to south between the densely-wooded portion on one side, and the comparatively bare tract on the other, would probably show that the forest and scrub with which part of it is covered is resorted to for timber, firewood and other forest produce by the inhabitants of a large part of the whole country, and that in many parts these forests are in a very poor state, and may not be sufficient for future requirements, should cultivation extend and population increase.

"One of the principal causes of this state of things is the almost universal custom of allowing cattle to graze over the whole of these forest lands.

"Now in the warm and dry climate of a great part of Mysore, it is doubtless beneficial to have grazing grounds studded with trees and brushwood. They afford shelter and shade to the cattle, they retain moisture in the soil, and thereby protect the grass against the scorching sun; but, if at the same time these grazing lands are expected to yield wood and other forest produce, they must be subjected to a regular system of management. Cattle must be excluded from those parts where young forest is growing up, and admitted only where the trees are sufficiently advanced to be beyond the probability of being injured by them. A systematic management of this sort will be established in the State forests as soon as they have been placed under the complete control of the Forest Department, and though it may be necessary at first to exclude cattle absolutely from all State forests for a series of years, still there will be no necessity for always doing so. When their management has further advanced, the greater part of mature and middle-aged forest may from time to time be opened for the grazing of cattle. In the unreserved forests it would, under present arrangements, be out of the question to introduce a regular system of management like that just indicated.

"4. *Advantages of establishing Village Forests.*—But an attempt might be made to render this possible by the establishment of village forests, to be placed under the control of local Forest Officers who would manage their forests under the direction of the regular Forest Department. This is the principle which obtains in France and in other countries of the continent of Europe with the most beneficial effect. The communal or village forests, though generally falling short of the high standard of productiveness of the State forests, are still under a fairly efficient management, and are protected against devastation. A proposal of a similar character to assign to each village, or group of villages, a certain tract of jungle to be appropriated for the use of the ryots, was made by Captain Hay, Superintendent of the Nuggur Division, on 15th May 1867.

"5. *Grazing land must be included in Village Forests.*—One condition indispensable to the success of this plan appears to be to include in the village forests all or the greater portion

of the grazing lands as far as they are not arable. Indeed, the same land will, as at present, serve for the grazing of cattle and for the supply of timber, wood and other forest produce. This will make it possible to establish a kind of rotation in the working and grazing of each village forest. In most cases, it is believed that these forests or scrubs will have to be treated as coppice woods, to be cut on a rotation of from ten to twenty years according to circumstances, reserved standard trees being left on the ground to secure a better reproduction of the coppice, and when mature to be cut for timber. Now, it is impossible for coppice wood to grow up in a satisfactory manner if cattle are admitted directly after it has been cut. The fresh-cut areas will therefore have to be closed in some parts for five years, in other parts for a longer period, until the shoots are beyond the reach of cattle. The remainder of the village forest may, in most cases, be left open for grazing. In many parts of the country this arrangement could not be carried out if the greater portion of the present grazing lands were not included in the village forests. The area would be too confined to admit of the establishment of a rotation, and all the contingent advantages of the system would be lost. Indeed, were this point not admitted, it would be better to abandon the establishment of village forests. On the other hand, it is certain, that under the system like that here proposed, the grazing lands will greatly improve, and be made to furnish more abundant fodder for cattle.

"These village forests are not, however, intended for the exclusive supply of the village to which they belong. The inhabitants of the bare country in the vicinity may, as heretofore, resort to these forests to supply their wants, but all moneys paid by them on this account will be credited to the village, or group of villages, to which the forest belongs.

"6. *Revenue of Village Forests.*—Thus it is hoped that the villagers to whom the forest has been assigned will gradually come to feel an interest in its maintenance and improvement. Their forest will not only supply them with the needful grazing and forest produce, but will also yield them an annual income, the surplus of which may be laid out, under the supervision of the Civil Officers, on works of local improvement. If this plan is carried out, the following items of revenue will be given up by the State and assigned to the forest villages :—

First.—"Grazing dues" on all unassessed land except the State forests and Amrat Mahal lands. In the last-named lands, no interference with existing arrangements is proposed.

Second.—The forest revenue hitherto obtained from the unreserved forests.

Third.—Revenue from minor forest produce as far as the village forests are concerned.

"It remains to be decided whether the prospective advantages of establishing village forests are sufficient to justify the giving up by the State of these items of revenue.

"7. *Object.*—Village forests are to supply the following descriptions of forest produce, and forest produce generally, *first*, to the villages to which they are attached, and *secondly*, to the inhabitants of other villages :—

1. Firewood for industrial and domestic use.
2. Wood for agricultural implements and carts.
3. Wood, thorns, and bamboos for fences, stack floorings, sheep-folds and cattle-pens.
4. Wood, bamboos and timber for building.
5. Leaves and branches for manure.
6. Grass for thatching.
7. Grazing of cattle.

"8. *Improvement of grazing grounds in Village Forests.*—It should here be explained that the improvement of the village grazing grounds is one of the principal objects aimed at by the present proposals. In those taluks which are thinly wooded, and which are generally known as the Maidan Taluks, two circumstances have appeared to me remarkable during my late journeys—the lean and poor condition of the greater part of the village cattle, and the wretched state of the grazing grounds which are not reserved as Amrat Mahal lands. This does not refer to the Mulnaad Taluks, or to those Maidan Taluks which possess jungle. And I fully acknowledge that much may be ascribed to the succession of several unusually dry seasons, and that my opportunities for observation were limited.

"If, in the opinion of the Revenue Officers, the grazing grounds are upon the whole in a satisfactory condition, if no measures for their improvement are called for, then there would appear to be no necessity on this account for the establishment of village forests. But should in some taluks improvements appear desirable, then the following suggestions might appear worthy of consideration :—

First.—Grazing grounds which are insufficiently stocked with grass and other fodder plants, should as far as practicable be partially closed for a series of years, and be allowed to recover. They need be closed for part of the year only, the latter half of the dry season and the first half of the rains. The dates for closing and opening them would differ in different parts of the country; in some taluks, March to August might be sufficient.

District Officers will probably agree with me, that during the hot season cattle do most injury to the poorer grazing grounds. The tufts of grass are trodden down, eaten up, always injured, and often destroyed; blank spaces are formed, and the first rush of rain carries away the loose soil, and the reproduction of grass and herbs during

the rains is impaired. Again, during the first part of the rains young plants spring up, and they should have time to gain strength before cattle are admitted. In some taluks it will be better to keep such grounds closed until after the rains.

Second.—Encourage the growth of trees and shrubs and bamboos, to give shelter to the cattle, but mainly to keep the ground more cool and moist, and thus to favor the growth of grass and herbs. This will be effected by placing the grazing grounds under the same rotation as the other parts of the forest.

Third.—Goats to be excluded altogether from the more valuable forests and grazing grounds.

Fourth.—Fires to be kept out wherever practicable, at first on a small scale only as an experiment.

Fifth.—On grazing grounds entirely bare of trees and brushwood, suitable spots to be enclosed in hollows and Babool (*Acacia arabica*), Kugli (*Acacia Catechu*), and other hardy trees to be sown or planted.

"In some taluks, trees might be planted with the special object of utilizing their branches and leaves as cattle fodder.

NOTE.—Trees that might be planted on grazing grounds in the Eastern Districts:—

Black Babool (Kari Jhalla) *Acacia arabica.*
White „ (Bill Jhalla) „ *leucophlœa.*
Kugli, *Acacia Catechu.*
Mugli, „ *Sundra.*
In low places near stream beds, Hongay, *Pongamia glabra.*

"The beneficial effect of most of these measures will scarcely be denied; another question is whether they are necessary in this country.

"9. *Village Forests how constituted.*—Wherever practicable, a village forest should be within the boundaries of the village to which it is attached. It will consist, as a rule, of the jungle and grazing lands attached to each village, as far as they have not been taken up by the Forest Department as reserved forests, or by the Amrat Mahal. Wherever possible, the village forest should be of sufficient extent to supply the requirements of the village, including the requirements of those industrial establishments (on a limited scale) existing in the village, such as sugar boiling, smelting iron, lime and brick burning, and charcoal making. The village forests will consist of all or a portion of the land covered with forest, brushwood and grass, and all such land as has, or is likely to be, set apart by the Revenue Survey Department for grazing. Thus the village forests would comprise the unarable waste as recorded by the Revenue Survey, unless such waste had been set apart for other purposes.

"No arable assessed land or waste land in the vicinity of the village used for special purposes, should be included. The present proposals apply to Government villages only; Inam lands or Inam villages should not in any way be interfered with.

"10. *Grouping of the forest lands of several villages.*—In many, perhaps in most cases, it may be necessary for purposes of management, to include in one block the forest area of several contiguous villages. The forest land of one village alone may be either too small, or its shape unsuitable for separate management. In such cases, the revenue will be credited to each village in proportion to the extent which it contributes towards the formation of the whole block. By this arrangement, the existing boundaries will not be interfered with. Should there be any forest land at the disposal of Government which does not form part of any village area, such land might, if not otherwise required, be included in any village forest."

61. These proposals, however, were declined by the local officers and by the Government of India; but in the Kolar District, the Deputy Commissioner, Mr. Krishnaiengar, expressed an opinion favorable to the scheme as follows:—

"From B. KRISHNAIENGAR, Esq., C.S.I., Deputy Commissioner, Kolar District, to the Superintendent, Nandidroog Division, No. 1139-476, dated the 14th January 1869.

"In reply to your docket, No. 3799-383, of the 22nd ultimo, I have the honor to state that I fully agree with Dr. Brandis that village forests should be formed: in fact I suggested this in paragraph 39 of my Administration Report for the year 1867-68.

"No separate establishment, however, such as that proposed by Dr. Brandis, is in my opinion necessary; it is sufficient if suitable land is assigned to each village, or group of villages for the purpose, and the Revenue authorities can easily get trees planted by the ryots *gratis*, as, from the communication I had with several of them, I am sure they will willingly do the work, which they know will be for their own advantage."

62. And the same officer set on foot in his district a modified system which is described by him as follows:—

"MEMORANDUM on the Management of District Forests in the Kolar District of the Mysore Province, by B. Krishnaiengar, C.S.I., Deputy Commissioner, Kolar District; dated Camp Gumnaikanapalya, the 30th July 1878.

"1. This district has or had no forest producing any valuable timber such as Teak, Blackwood and Honne, but there are many tracts where other species of wood such as Jalari (lac),

Babúl, Nim, Karanj, &c., could be grown, and numerous forests of this kind appear to have been in existence in former days. These had all, I believe, been formed and conserved by the villagers with the aid of kavalgars or watchmen who were, as a rule, remunerated by the village agricultural community, the Government only supplementing the remuneration by small grants of Inam lands in some special cases, but these forests gradually disappeared as the patels gave up their interest in them in consequence of their service Inam lands having been thoughtlessly resumed about 60 years ago by the Government of the day.

"2. I was sadly struck with the barrenness of the country when I first took charge of the district in 1864, and having spoken to the intelligent and influential patels on the subject, pointing out to them the great benefit the ryots would derive from having wood in their neighbourhood, and assuring them that their services in conserving forests would be recognized by the present Government, they conserved suitable tracts within the limits of their villages, and their example is now gradually followed by others.

"3. At the outset, there was, of course, some difficulty in reviving the good old custom of the country about the conservation of forests, but it is no longer felt, as under the arrangements made in this district the sympathies of the very parties from whose reckless and clandestine felling of the wood we have to protect the forests are enlisted, and they are made responsible for their conservancy, bearing themselves all the cost of it, instead of employing any outsiders to watch the forests, and subjecting the ryots to all sorts of annoyance and hardship.

"4. The following are the arrangements:—

I.—No lands cultivated or cultivable which are close to the village, nor those conveniently used as pasturage common, to be taken up for forest.

II.—Mountains and hills, and in their absence other uncultivable lands at some distance from the village, to be reserved for growing wood.

III.—In rainy seasons, the ryots to put down in the reserved tract seeds of indigenous trees commonly grown in the locality.

IV.—The patel to employ one of the village servants, where available, and some one else in other places, to watch the forests of his village, making arrangements with the ryots about the remuneration of the servant so employed.

V.—The ryots of the village concerned to be allowed in return for this service, to collect dried brushwood for fuel and cut long grass for thatching, &c., in the reserved tracts.

VI.—None to be allowed to let the cattle, particularly goats and sheep, into the reserved tracts, until at least the trees grow to such a height that the beasts could do no injury to them, and none to enter into them with any cutting instrument.

VII.—No one to fell any timber or bamboo without obtaining a license from the District Officer, and no license to be issued without previously consulting the patel as to the fitness of timber or bamboo to be cut, as he is held responsible for the growth and protection of the forest of his village.

"5. It is the duty of the patel to report if any mischief is done to his village forest, and such mischief is punished for either under the Forest Rules or the Indian Penal Code.

"6. The Shekdars of Hoblies are to inspect these forests as often as possible, and see that the above arrangements are carried out properly, reporting on their condition to the Amildars, who are again to submit their reports to the District Officer after their periodical inspection.

"7. The forest conservancy under the above arrangements is working smoothly, and the patels and shanbôgs generally take so much interest in this good work, that in many places they have employed men to watch the forests of their villages, either setting apart the produce of a particular portion of their own holdings or cultivating and paying the assessment of a separate field, for their remuneration, and also arranging with the ryots to pay their quota of the remuneration in grain at so much for a plough; and I have also in a few cases obtained the Chief Commissioner's sanction for the continuance to the hereditary watchmen of their service Inam land which had been resumed under the recent settlement of the Inam Department.

"8. There are now many forests thus managed in all the 10 taluks of this district, the number of the extensive ones being 67, and their approximate area in round figures being 152,000 acres, excluding the petty village forests, of which there are hundreds. Sir Richard Meade was pleased to inspect some of these forests when he made a tour in this district in 1874 and distributed presents to some of the patels in recognition of their services in this matter.

"9. There are still many tracts in this district fit for growing forest, and with some exertion on the part of the Revenue Officers, they can also be easily conserved, as new Inam lands or other emoluments are now attached to the office of patel.

"10. With the object of encouraging the individual ryots to grow forests, I proposed some time ago that the system introduced by the Survey and Settlement Department of putting up annually to public auction the unarable lands for grazing purposes, may be discontinued, and such lands leased out to individual villagers at a fixed pasturage rate which, in this country, is 1 anna and 9 pies per acre, the Government reserving their right to all the wood therein grown; and the Chief Commissioner, Mr. Dalyell, was pleased to observe in his Proceedings of the 7th May 1876 that the matter was under his consideration, and that information was called for from the Commissioners of Divisions on the subject, but the question still remains unsettled. My belief is that if this proposal be carried out, it will not only enable the

Government to get permanently more revenue than the fluctuating income it now derives from the annual sale, but will also obviate the trouble of selling each number every year, a practice by which the Government loses when there is a combination in the village, and the ryots suffer if there are factions among them, one party bidding against the other, not for gain but from spite.

"11. If one man is allowed to take up such tracts of land as may not be required for the Government forest, at fixed rates for pasturage, he will necessarily let trees grow, as a piece of land under the shade of trees retains more moisture which adds to the growth of grass, whereas the purchaser of the grass at the annual public sale simply looks to his gain for the year without caring for the trees growing in the land. This is not my mere conjecture. There are instances of lands leased out at pasturage rates in some part of the country not yet surveyed being covered with trees, while those annually sold are quite bare and treeless."

I regret that it has not been within my power to visit the village forests in the Kolar District here described.

63. In advocating the establishment of village forests, and the insertion of provisions for village forests in the Indian and Burma Forest Acts, I have had before me the beneficial effect of Communal forests in Europe. There are many districts in France, in Germany and Italy, where well-managed Communal forests are a source of wealth to the country. The revenue from these forests pays for the construction and maintenance of roads, bridges, churches, school-houses and other public buildings, and there are many towns and villages where a large portion, and in some cases the whole, of the Municipal expenditure is covered by the revenue derived from forests belonging to towns and villages. But even in Europe the necessities of the present are stronger than the care for the future, and the Communal forests would be worked in a wasteful manner if their management were not controlled by the State.

Chapter VI of the French *Code Forestier* provides for the management of Communal forests under the control of the State Forest Officers, for which control the Commune pay to Government a proportion of their forest revenue. Similar provisions form part of the Forest Law in other countries.

64. This is the line which must be taken in the Madras Presidency, when the time comes for the formation of village forests. The necessary work of protection and improvement must be done by the people, or at their expense, and the management, including the working of the forests and their use for pasture, must be controlled by the State Forest Officers.

Obviously the task of exercising an efficient and beneficial control over the management of village forests will be difficult and delicate, and should not be attempted until Government has at its command a body of efficient Forest Rangers and Foresters, who have learnt their profession, and who have acquired the needful experience through the management of State forests.

65. So much remains to be done in the Madras Presidency for the formation of State forests, and the success of these undertakings is as yet so doubtful, that it seems better to defer the consideration of the measures which must eventually be taken for constituting village forests, until forest administration is more firmly established.

The present staff of Forest Officers—superior and subordinate—in this Presidency will barely be found sufficient to do justice to the most urgent work, that is, the constitution, protection, and management of reserved forests; and the chief condition of satisfactory progress is, to undertake one task at a time, and not to fritter away the strength and time of the officers whose services are available, by imposing upon them a variety of duties. These are the reasons why I have not recommended that a chapter on village forests be included in the Madras Forest Act. Had provisions authorizing the establishment of village forests been inserted in the present Act, the result would be that in many cases, when the establishment of reserved forests under the Act is proposed, a discussion would arise as to whether such lands should be made "Reserved Forests" or "Village Forests." Such discussions are premature as long as the agency at the disposal of Government for the administration of forests is in its present imperfect state, and they would only result in delay and waste of time. Under existing circumstances all that can be attempted with reasonable prospect of success is to constitute reserved forests under the Act, and then to manage them by the Government Forest Officers. Later on when

experience has been gained, and when the cost of efficient protection and good management of Government waste lands and jungle in the plains has been determined by actual experience, then the project of village forests must be taken in hand, and if it should be found necessary to give such project the support of a legislative enactment, it will not be found difficult to frame such an enactment.

I submit an emphatic warning against any attempt at present to undertake several things at the same time.

Land at the disposal of Government not included within Reserved Forests.

66. Regarding the management of the lands which will not be included within reserved forests, I beg reference for all matters of detail to those portions of this report which relate to the districts visited by me. In the present place it will suffice to state that the general policy must be to maintain a certain protection of the forest growth, to guard against needless alienation of such land, to protect certain valuable kinds of trees which for convenience sake are called reserved trees, and to produce sufficient revenue from these lands to cover the cost of the formation and management of reserved forests, until the revenue derived from these reserves is sufficient to cover the outlay on account of them.

Reserved Lands.

67. To facilitate the attainment of the first two objects named, certain provisions prescribing the formation of reserved lands, and the declaration of reserved trees were inserted in the Bill submitted by the Forest Committee. Those provisions have, at the suggestion of the Government of India, been excluded from the Act, and an endeavour must now be made, by means of rules made under Section 26, to introduce the necessary provisions. As regards reserved lands the intention was, by legislative enactment, to guard against the alienation of lands which may hereafter be required for the formation of reserved forests. There is no doubt that some action in this respect is necessary. The constitution of reserved forests must necessarily be a slow process, and in many cases it can only gradually be decided, as the result of protracted experience, what areas should be selected to be permanently maintained as forest. But what can, and should be done, is to facilitate the formation in the future of reserved forests by guarding against alienation, the result of which might be to cut up the blocks, and to render the formation of such forests difficult or impossible.

68. Accordingly it was proposed to invest the Collector, subject to the sanction of the Board of Revenue, with authority to declare any lands at the disposal of Government to be reserved lands, and at the same time to provide that such lands may not be excluded from the lists of reserved lands, except with the sanction of the Governor in Council. And it was intended that the legal effect of declaring such lands reserved should be to prohibit their alienation by the grant of pattas.

This it is true might also be effected by an executive order of Government; but cases have been so frequent, under the existing practice, of pattas being granted in land which it is proposed to reserve, and, even in areas which have actually been reserved, that after consulting experienced Revenue Officers, I came to the conclusion that nothing short of a legal provision could be expected to protect such lands from alienation.

Under the existing practice, if pattas are granted under a misapprehension, they can, I understand, only be cancelled if fraud is proved; and this obviously in most instances is exceedingly difficult.

The custom of cultivating waste land, without authority, is very common in most districts of this Presidency, and the existing law does not seem to furnish a sufficient remedy in those cases where it is not expedient to encourage the extension of cultivation. It was therefore proposed to make the squatting, without authority, on reserved land a penal offence.

69. Obviously it is essential effectively to guard against alienation of reserved lands. Under the existing practice, if the land is unassessed waste, the Collector has the power to charge punitive assessment; but, considering that the area occupied

by squatters is not entered in the village register, it becomes exceedingly difficult, without undue loss of time on the part of the superior Revenue Officers, to apply this remedy, and, as a matter of fact, it is applied very sparingly. In the case of assessed waste, the Collector has practically no remedy. These remarks relate to districts in which the Revenue Survey has been completed. Where this is not the case, squatters, as a matter of fact, take up land where they like.

The existing custom is the result of the desire, which is fully justified under certain circumstances, to promote the extension of cultivation to the utmost. It was not intended to check such extension where it was desirable that waste lands should be brought under the plough, but to give Government power to secure, eventually, compact blocks, for the growth of wood and the production of cattle-fodder in those localities where cultivation has already attained its maximum limits consistent with the prosperity of the district, and where it is desirable to form forest reserves for such purposes. It was also intended that reserved land might at any time be granted for cultivation under short leases.

70. For these matters it will now be necessary to provide, partly by rules to be made under Section 26 of the Act, which will have the force of law, partly by executive orders, and I am disposed to think that it will be convenient to use the term " Reserved Lands," although it does not occur in the Act, and that it will be expedient to provide that a formal declaration of reserved lands be made in the District Gazette.

It should be provided, by distinct administrative orders, that reserved lands must not be alienated under the waste-land sale rules. Paragraphs 18 and 24 of Standing Order of the Board of Revenue, No. 34, exclude from the operation of these rules reserves of grazing and forest land, of land for the growth of firewood, and forests containing valuable timber. The needful addition should be made to these paragraphs. It should also be provided by administrative orders that, in the surveyed taluks, the needful entries be made in the village registers, to show which survey numbers have been included in reserved forests under the Act, and in reserved lands under the rules proposed to be made. This obviously is essential.

Reserved Trees.

71. Rules to secure the protection of forest-growth, on land at the disposal of Government, not included within reserved forests, must be made under Section 26.

The rules which at present exist for the management of forest land not included within reserved forests are the following:—

(i.) The Jungle Conservancy Rules (Board of Revenue Standing Order No. 92).

(ii.) Rules for the conservancy of the forests in the Madras Presidency of April 1863.

(iii.) Special Rules for the Forest and Jungle Conservancy lands in several districts.

(iv.) Special Rules under which free felling is allowed in certain districts.

The trees to which these rules apply are classified as " reserved " and " unreserved. " Reserved trees may not be cut for charcoal; they may not, as a rule, be granted on free permits; and some of them may not be felled without express orders from the Forest Department, while others may be felled on license, but at higher rates than those charged for unreserved trees. Under the Jungle Conservancy Rules, there are two classes of reserved trees—

(1) trees which are to be reserved for the value of the wood, comprising seventeen kinds; and

(2) trees or shrubs which are to be reserved for the value of their products, comprising ten kinds.

In the first class are included teak, sandal, and red sanders.

The local rules for each district contain separate lists, often comprising a large number of names. Thus in the South Arcot District there are no less than 33 reserved kinds.

72. As regards reserved trees, I may mention that it has been found a very useful practice in most provinces to place certain valuable kinds under special protection by declaring them to be reserved trees; but it has also been found that the measure can only be effectual, and practically useful, if the number of reserved trees is limited. It is necessary, during the long period which must elapse until the reserved forests in the Madras Presidency have been formed, strictly to protect a few of the more valuable kinds, such as teak, sandalwood, and red sanders; but if the list is extended so as to comprise a large number, the provision becomes unworkable. The wood of three, or of even half a dozen, kinds can be recognized and identified with sufficient certainty to enforce their protection; but if the list of reserved trees includes a large number of woods, the door is open to uncertainty, and all kinds of fraud and exaction.

73. As a matter of fact, the special protection hitherto accorded to red sanders in the Cuddapah District has been exceedingly beneficial. Not only are large tracts now stocked with saplings and poles of this valuable tree, the old trees having long ago been cut out, but the protection of the species has also prevented the denudation of many hill slopes, because, though the other kinds were cut indiscriminately, this species has been protected. Sandalwood also has been effectively protected in most districts, and this will greatly facilitate the realization of revenue in many forest reserves which must be formed.

The protection of teak has been exceedingly unequal, and it is much to be regretted that this valuable tree has been almost completely extirpated in many forest districts. In Bellary and Anantapúr, yépi (*Hardwickia binata*) has received special protection to the great advantage of the country.

I would therefore suggest that in lieu of the present lists of reserved trees, a few of the more valuable kinds in each district be selected and declared reserved trees.

The Act contains no provisions regarding reserved trees, but it is hoped that in the rules to be made under Section 26, it may be possible to introduce rules to secure the protection of certain selected kinds. In the circumstances here mentioned I have decided, although the Act contains no provisions regarding reserved lands and reserved trees, to use these terms throughout the present report.

74. Under Section 26(*a*) rules can be made to regulate or prohibit the shifting cultivation known as *kumri* or *ponakád*. As a matter of fact this practice has been prohibited by the Collectors in certain districts, particularly in the Salem District; and the rules made under this section will give legal authority. *Kumri* has been prohibited in Coimbatore and some other districts, but the prohibition has remained a dead letter. Under the same section, rules should be made to regulate the cutting, collection, and removal of timber, as well as of natural produce; to regulate the sale, or free grant, of timber and other produce; and to prescribe the fees, royalties, or other payments to be made for such timber or produce.

Provisions having the force of law to regulate and prohibit the kindling of fires, and to prescribe the precautions to be taken to prevent the spreading of fires, are a necessity. Chapter II contains the needful provision against fire as regards reserved forests; and Section 26(*b*) and Section 27 give power to enforce similar provisions in all lands at the disposal of Government.

Pasture.

75. Section 26(*e*) further empowers Government to regulate the cutting of grass and pasturing of cattle; and the payments to be made therefor.

This is a most important subject, regarding which the existing forest rules are silent. In most districts of this Presidency, pasture on Government land is free to every body, without restriction, but grazing dues are levied in certain Government jungles of Nellore, Kistna, South Coimbatore, Tinnevelly, Madura (just sanctioned); and in some districts free grazing-grounds have been assigned to villages.

Before 1869-70 (Fasli 1279) the Government jungle lands in the Kistna District were rented out for grazing, agreeably to the orders of 1856 abolishing the old *pullari* tax, and the average rent for the five years before Fasli 1279 was Rs. 30,460.

This practice was changed by the then Collector, and, instead, the pasture on all the waste land of a village in excess of 30 per cent. on the occupied area was leased out, and under this system the average rent for the five years ending with Fasli 1288 was Rs. 70,299.

In their orders of the 16th October 1880, Government directed that this system be discontinued and that, instead, a certain area should be reserved as common grazing ground not available for occupation; and that, after due provision had been made for the grazing requirements of a village, the right of grazing over extensive tracts of waste might be leased out, and grazing fees be levied from others than villagers having customary rights and privileges.

In the same orders Government directed that the proceeds of these grazing rents or fees should be credited to the Jungle Conservancy Fund. The receipts under this system amounted to Rs. 26,000 per annum, which amount was expected to be somewhat diminished by the formation of reserves and by closing them against pasture.

76. In the Nellore District the *pullari* tax was abolished in November 1867, and the present system was substituted, under which certain tracts in each village, amounting to an area equivalent to 30 per cent. in the first instance, which subsequently was increased to 150 per cent. on the cultivated area, were set apart as free grazing grounds, the remainder being let out for pasture. The average revenue from this source is stated to amount to Rs. 15,000 a year, which is credited to "Land Revenue Miscellaneous." From the Jungle Conservancy Report for 1880-81 it would, however, appear that in some tracts grazing dues are credited to "Jungle Conservancy."

On certain lands it is probable that fees are charged for pasture or fodder-grass in some of the other districts, for in the report on Jungle Conservancy for 1880-81 the following items are entered under "Grass and minor produce in jungles":—

	RS.
North Arcot	218
South Arcot	658
Chingleput	406
Kistna	3,001
Madura	2,189
Nellore	3,534
Tanjore	976
Trichinopoly	1,071

77. Lately the levy of grazing dues has been sanctioned in the districts of Coimbatore, Tinnevelly, and Madura.

In Coimbatore the Forest Committee, appointed by G.O. of the 20th July 1878, to select and demarcate close reserves in the hills of South Coimbatore, and to inquire into rights in Government forests, recommended that a fee of one rupee per annum should be levied on each bullock or buffalo driven into the hills to graze, but that sheep and goats should be excluded from the privilege of hill grazing. The Forest Department had previously levied grazing dues during two seasons in the Kullapuram reserve.

The Government, in passing orders on this report in August 1879, authorized the levy of an annual fee of two annas per head for cattle grazing on Government waste lands on the hills, and directed that the grazing of sheep and goats should be confined to the hill slopes. The collections under this head in 1880-81 amounted to Rs. 1,330, and were expected to increase.

78. In Tinnevelly, the District Forest Committee, appointed in 1879 for the selection of hill forest reserves, proposed that portions of the areas proposed to be reserved, such as open grass lands, should be made available for the depasturing of cattle on payment, so far as might be found compatible with the preservation and improvement of the forests, the fee not to exceed three annas a head. The Government, in passing orders on this report in February 1881, said that, ordinarily cattle should be excluded, but that if, in special cases, grazing could be permitted in certain portions, the details of the arrangements might be left to the Conservator,

79. By G.O., dated the 20th July 1878, a Committee was appointed to report regarding forest reserves in the District of Madura. In their report they recommended the same arrangements as in South Coimbatore, viz., that a fee should be levied on cattle depastured on Government waste lands on the hills, and recommended the same maximum rate as in Tinnevelly, viz., three annas a head.

Government, in passing orders in August 1881, sanctioned a grazing fee of two annas per head per annum for cattle on Government waste land on the hills, the grazing of sheep and goats being confined to the hill slopes.

In a correspondence between the Collector of Madura, the Conservator, and the Board of Revenue, on which no orders have yet been passed, the Conservator proposed that sheep and goats should be restricted to the lower slopes or other localities as might be set apart by the Collector, and that they should pay a fee of six pies per head; that cattle should pay for grazing both on the plateau and on the slopes; and lastly that the villages on the hills should pay the same fees for their own cattle as are paid for the cattle of other villages.

80. In South Arcot, the District Forest Officer submitted a proposal, in September 1881, that fees should be levied on cattle brought to graze in Imperial reserves. The Collector, in addressing the Board of Revenue on the subject, recommended that fees should be levied on cattle brought from other districts, but observed that the ryots of the South Arcot District appeared to have the privilege of free grazing in almost all the reserves for certain periods of the year, and recommended that this privilege should be left undisturbed for the present, and that nothing should be charged for bundles of grass cut by them.

The Conservator, in writing on the same subject, proposed that grazing fees should be charged everywhere on Government waste land.

81. On this subject it may perhaps be useful to make the following general remarks:—When areas have been constituted reserved forests under the Act, pasture is prohibited by law, except where a right to such pasture has been admitted. If it is considered compatible with protection and otherwise expedient to permit pasture in reserved forests, this must be done by separate bargain or other arrangement to be made in each instance, according to the circumstances of the case. The arrangement should be made with some influential persons in the vicinity, who should undertake the protection against fire of the blocks allotted to them for pasture. This suggestion will be found explained more in detail in some of the district chapters. What I would deprecate most emphatically are general orders by Government, permitting pasture in the blocks opened for the purpose to all on payment of a fixed rate. Such an arrangement would render fire protection difficult instead of facilitating it.

It is different in areas not included within reserved forests. Here there is no object in altering existing arrangements, and as a matter of course it is desirable to realize as much revenue as possible from these areas, in order to meet the heavy outlay which forest conservancy necessarily entails.

82. As regards the allotment of free grazing grounds, I have explained in other places of this report, that wherever possible this question should be taken up in conjunction with forest conservancy arrangements. If possible free grazing grounds should not be unconditionally surrendered to the villagers. These areas may either be required for the formation or extension of reserved forests, or eventually they may be included within the limits of village forests. All I urge is, that the future organization of forests and grazing grounds be not made difficult by arrangements regarding the allotment of free grazing grounds.

What I have submitted regarding grazing, applies also to the cutting of fodder grass. In areas constituted reserved forests under the Act, grass like other produce must be disposed of by special arrangement, the conditions of which must be regulated by the circumstances of each case. I would deprecate the issue of general orders on this and similar subjects by Government.

Thatching Grass.

83. In connection with fodder grass it will be well to advert to the question which has lately been raised as to how thatching grass should be dealt with. The

Board of Revenue recommended that no seigniorage be paid on thatching grass, and that it be cut free of charge. In this the Government in their orders of 12th October 1882 concur, and add that in reserved forests the question must be dealt with on its merits in each individual case.

84. Without in any way desiring to express an opinion different from the orders passed by Government in the present case, I submit that a general order permitting the free use of an article of forest produce throughout the country, may in certain cases cause a needless sacrifice of revenue. In their Proceedings of the 28th August 1882, the Board of Revenue explain, that fees on thatching grass had been levied on the lankas (islands) of the Godávari and Kistna rivers, in Tinnevelly, and in the Pálghat forests of Malabar. The revenue from this article is probably of very little consequence. What I would submit is, that where no rights to any forest produce exist, it might be left to the Collector, acting under the general control of superior authority, to arrange for its disposal according to custom and the circumstances of the case. In reserved forests all produce, if not claimed by virtue of a right, should always be disposed of by the officer in charge to the best advantage.

Revenue on Wood and Timber.

85. Regarding the system of levying revenue on firewood, timber, barks, charcoal, and minor produce, I shall not here enter into details. As regards reserved forests no general rules can be laid down. The officers in charge of these Public Domains must make the best arrangements possible in each case to dispose, to the best advantage, of the forest produce which the forest can yield, and which may not belong to persons having rights in the forest.

In the Government lands outside the reserved forests, I recommend that at the outset the existing system may be permitted to continue, under arrangements which will secure its efficient working. The main features of the existing system have been put together in a joint memorandum by Messrs. A. W. B. Higgens and C. G. Douglas, Deputy Conservators of Forests, which will be found as Appendix VII.

86. In this place I shall limit my remarks to the rates paid as seigniorage for firewood. Up to 1860 firewood was free throughout the country. In 1860, in order to defray the cost of Jungle Conservancy, which was established about that time, what was called a fuel tax was ordered by the Board of Revenue, and the amount levied was 5 annas per cart-load. Ryots continued to take firewood free from lands at the disposal of Government, but the rate was levied on all wood brought to towns and villages for sale. The privileges of ryots in this matter have not, as far as I know, been clearly defined. Ryots who have jungle in the areas of their villages or in those of adjacent villages, where the Collector permits them to cut, pay nothing for the firewood cut and brought in by them for their own consumption or for sale within their villages. This privilege is exercised subject to the condition that certain reserved trees may not be cut for firewood, and in certain tracts the additional condition is imposed, that dry wood only may be collected free of charge.

87. Proposals were received from several District Officers to raise the seigniorage on fuel, the argument brought forward being, that if Government allow firewood to be cut in their jungles for less than it can be grown, private individuals cannot afford to grow it. At the same time the railways were built, and with special reference to the fuel consumption by the railways it was urged that the seigniorage must be regulated, so that Government might not sell timber below its value, and that it should be raised gradually to the proper amount, estimated from the cost of producing the wood. Accordingly in 1868, while the seigniorage to the public remained unchanged, Government raised it to 10 annas per 1,000 lbs. for the Railway Companies.

Meanwhile the consumption of wood-fuel by the railways, which was only 9,821 tons in 1863, had risen to 54,358 tons in 1868, and consequently, in July 1869, Government raised the rate from 10 annas to 1 rupee per 1,000 lbs., and made this rate applicable to all purchasers. It was urged that neither 10 annas nor 1 rupee adequately represented the cost of production, and that it was not expedient to charge different prices to different purchasers.

In consequence of these orders of Government, the Board of Revenue directed that 3 annas be charged per bullock-load of 200 and 9 pies per head-load of 50 lbs., and later on the Conservator did the same for the forests under his control.

88. By these orders the seigniorage on fuel was suddenly trebled all over the Presidency and more than trebled in some parts, and the result is reported to have been loud and universal complaint.

The Board of Revenue represented the matter to Government in their Proceedings of the 23rd August 1871. The Board urged that the people have a right to cut firewood for domestic use, for sale to others in their own village, and for the manufacture of the produce of their own lands, and that the State is not at liberty to sell as much of the firewood and timber as it chooses, at any price and to any purchaser. They admitted however that, if there were no railways, it would be just for Government to conserve the jungles for the people, charging them enough to cover the cost of conservancy, and to raise a revenue from any surplus of timber not required to supply the wants of the people. They further urged that the presence of railways is a novel and unprecedented event, that the operations of Railway Companies, as long as firewood is used by them for their locomotives, destroy the forests with startling rapidity, and that they should be charged enough to enable Government to reproduce the jungles from which the people had been entitled to a supply of fuel from time immemorial. They stated that 1 rupee per 1,000 lbs. is not equal to the cost of reproduction, and that the rate should be raised beyond this figure, but for Railway Companies only.

89. On this report Government passed orders on the 31st October 1873. They stated, that the fuel tax pressed with special severity upon the poorer classes of the population, and that to cheapen fuel would probably be as easy a mode as could be devised of lightening the burdens of life among the industrious poor of this Presidency. Government therefore authorized the Board of Revenue to issue instructions reducing the general rate of seigniorage to the old rate of 6 annas per 1,000 lbs. (5 annas per cart-load), and continuing the rate of 1 rupee per 1,000 lbs. to the railway.

90. At the same time they requested the Board to submit a full report on the general question of the railway fuel supply, with such suggestions as might occur to them for preventing the rapid disforestment, which was represented to be taking place in some parts of the country from this cause. This report was submitted on the 26th April 1875, and in paragraph 33 of that report, the Board of Revenue recommended to Government that the rate of seigniorage on railway fuel be at once reduced to Rs. 1-8-0 per ton, or 10 annas 8 pies per 1,000 lbs. This proposal was not, however, accepted by Government, and the seigniorage on firewood has ever since remained on the same footing, viz., 6 annas per 1,000 lbs. to the general public, and 1 rupee to the railway. This is the general rule, but there are special rates for certain districts, and there are certain exceptions which require brief notice. Thus on the Nílgiris, the rate for the general public is Rs. 1-4-0 per cart-load, while a lower rate prevails in the following districts: Kurnool and Kistna, 4 annas a cart-load; Godavári, 2 annas. In Ganjam the rate was formerly $2\frac{1}{2}$ annas a cart-load, which was, however, raised to 4 annas in 1881.

Again, head-loads, though brought for sale to towns, were, until recently, free in Salem and in some other districts when brought from Government forests, though payment on head-loads of firewood is levied by private proprietors.

91. In 1870 the question was raised in the Kurnool District, whether seigniorage should be paid for firewood used for sugar boiling and the manufacture of indigo, or whether it should continue to be free as hitherto. On the recommendation of the Board of Revenue the Government, in their orders dated the 6th January 1871, decided that the existing practice should be maintained, as it was desirable by all means to encourage such small industries as the manufacture of indigo and sugar by the growers. This decision was confirmed by the orders of the 31st October 1873, which stated, that it is in accordance with immemorial usage to permit villagers to cut firewood free for the manufacture of the produce of their own lands.

92. There is ground for believing that the operation of this order has in some districts, such as Bellary and parts of South Arcot, and probably also in portions of Cuddapah, accelerated the denudation of the country. Industries, such as iron smelting, sugar boiling, and the manufacture of indigo should certainly by all means be encouraged, but this must be done by promoting the growth of wood, and by discouraging its waste. And there is no doubt that the payment of seigniorage on fuel tends to make people more careful in the use of it. Seigniorage is levied on the charcoal used by the iron-smelters, and in some tracts, such as the Palmanér taluk of North Arcot, seigniorage is, or was a few years ago, levied on wood used by the ryots for sugar boiling (Colonel Beddome's Report of December 1876). I submit that the only satisfactory plan to promote these wood-consuming industries, is the formation of reserves which must be placed under strict protection, until sufficiently stocked to be worked systematically. Such reserves must at present be established and managed at the expense of Government, and it will probably not be maintained, that the wood produced in them must be given free to the ryots. In that portion of the Bellary District for instance, which is situated along the Tungabhadra river near the Sandúr Hills, much of the fuel used for sugar boiling is brought from the Sandúr forests, on payment, and it seems expedient that the resources of fuel still left in British territory, should be economized, until the reserves proposed to be formed have been brought to a good state of productiveness.

93. It seems to me to be a matter for consideration, whether the orders permitting the use of fuel free for sugar boiling and indigo manufacture, have really acted beneficially. As a rule, they have not helped the poorer class of ryots at all, but they have benefited Chetties and other well-to-do people, who were not in need of such help. I am disposed to think that the orders passed by Government, in respect of this matter, in 1871 and 1873, though well meant and having the appearance of generous liberality, will, when local inquiries in detail are made, be found not to have been advantageous to the poorer classes, for whose benefit they were intended. If these remarks are correct, it would be a good plan, in certain districts or taluks, to levy seigniorage on the wood cut on Government waste for sugar boiling and indigo manufacture, whether used by ryots or outsiders. My suggestion is, that the Member of the Board of Revenue who will have the control of forest administration should be authorized by Government to direct the levy of seigniorage in those districts or taluks where the measure appears to be called for. My opinion is that this, like many similar matters, cannot advantageously be dealt with by means of general orders passed by Government, applicable to the whole country, but must be considered in detail, with reference to the peculiar circumstances of certain districts or taluks. Since the above was written I have seen the orders of the Board of Revenue of the 16th November, requesting Collectors of all districts to report on the advisability of charging seigniorage on fuel used in sugar boiling.

94. Mercantile firms, such as Messrs. Parry and Co., in South Arcot, as a rule, pay seigniorage on the wood used by them in their distilleries and establishments for refining sugar. In some cases, however, large privileges have been conceded.

A case in point is the Aska Sugar Factory in Ganjam. Up to 1879, annual licenses, authorizing the cutting of an unlimited quantity of firewood for the use of their works, was granted at the rate of one rupee per license. Under this arrangement, they paid Rs. 73 for the whole of their supply during 1879-80. By G.O., dated the 24th September 1879, it was stipulated that they should in future pay at the rate of 4 annas per ton for the firewood used by them. In 1879 their annual requirements were estimated at 10,000 tons. In their Proceedings of the 6th July 1882, the Board of Revenue said that one of the chief reasons which had led them to advise the continuance of the special indulgence to this factory was, that representations had been made by the Firm, that, if such concessions were withdrawn, it would be impossible to carry on the business, and that the works must in consequence be closed.

No orders have as yet, I understand, been passed upon this subject, but there seems little doubt that eventually these works must pay for their fuel at the ordinary market rates, in the same manner as other consumers. At the outset the concession may have been necessary to aid a new industry, but it is not likely that such

concessions are necessary as a permanency. In one way or other they must result in waste.

95. I have said that until the areas which it is proposed shall be constituted reserved forests under the Act have been so far improved by efficient protection and otherwise, that they pay their way by the sale of the produce yielded by them, a large portion of the forest revenue must come from the lands at the disposal of Government not included within reserved forests, and it is of course desirable that this revenue should be sufficient to cover the heavy outlay which the demarcation and settlement of reserves will entail. Yet it will not be an easy task to increase the forest revenue. Grazing dues and seigniorage on firewood used for sugar boiling and indigo manufacture are almost the only new items of revenue which I can suggest. But a great improvement may, I think, be expected from more careful supervision in detail, and from more efficient management of the license and voucher system, and of the arrangements under which revenue on charcoal, barks, bamboos, and minor produce is collected.

96. In regard to these matters, I recommend a careful study of the system under which revenue on such produce is collected in the Central Provinces. It is an essential part of the proposals which I have been permited to submit for the better administration of the public forests in this Presidency, that the experience gained in the provinces under the Government of India shall be utilized in the work of organizing forest business in Madras. For this purpose I have urged that the second Conservator and two District Forest Officers be selected from the Forest staff in those provinces; and as a second measure in the same direction, I recommend that as soon as the needful arrangements can be made, one or two members of the Madras superior Forest staff be deputed to the Central Provinces for five months during the dry season, to learn the system of fire protection and the revenue management of the second-class reserves. The Chief Commissioner should be asked to attach these officers to two selected divisions, where they should be employed to assist the Divisional Forest Officer, or on such other work as the Conservator may direct.

For many years the surplus forest revenue in the Central Provinces was all derived from the second-class reserves (formerly called unreserved forests), but of late years the first-class reserves have commenced to yield a surplus, and the figures of 1881-82 are—

—	First-class Reserves.	Second-class Reserves.
	RS.	RS.
Receipts	4,16,000	7,57,000
Charges	2,56,000	2,41,000
Surplus ..	1,60,000	5,16,000

This is the result of good management, steadily continued ever since 1863.

97. As regards the reserved forests in the Madras Presidency, which are to be constituted and managed at the expense of Government, I desire to urge one point: that their working, and the system under which the revenue shall be derived from them, must not be regulated by general orders of Government; but that they are State Domains, which must, under such control as Government may direct, be managed to the best advantage by the officers in charge, on principles analogous to those on which private estates are managed.

Forests and Lands not at the disposal of Government or in which Government has a limited interest.

98. It is estimated that in the 18 districts, for which details are given in statement I, $20\frac{3}{4}$ million acres of forest and waste are the property of Zemindars and other landholders. In addition to this area, over 4 million acres in Malabar, Nílgiris and South Canara are private property, making the total of private forest

and waste in the Presidency 25 million acres. It must however be borne in mind that the rights of the State and the landholders over these vast areas of forest and waste are in many cases uncertain and have nowhere been finally settled and determined.

Section 33 of the Forest Act empowers Government to arrange for the management of forests in which Government and other persons are jointly interested. As far as my information goes, such cases are not common in the Madras Presidency. In lands held under patta, the holder has, as a rule, unrestricted rights to the trees standing on the land, but in some districts, particularly in South Arcot and Tinnevelly, I am informed that there are cases in which the trees are held under one, while the land is held under another, patta. In many districts, special pattas are held for the usufruct of trees standing on land which is the property of Government. Another case of joint interest is that of the pattas granted to the Todas for pasture, at low rates of assessment, for the forest and grass lands around their munds or settlements. On these lands Government maintains control over the trees growing in the sholas. These cases however can, as a rule, be dealt with under existing rules, and will not require action under the Forest Act.

99. It is possible that the *kumaki* lands in South Canara, that is, the jungle lands which surround the rice fields, are another case in point. But on the other hand it is not impossible that the *kumaki* lands are the property of Government, and that the Wargdars have only certain rights of user, to pasture, to firewood, and to the leaves and branches for manure. The case is not clear, and a collection of late papers, with a memorandum written by me on the subject in July last, will be found appended to the present report. (Appendix V.)

100. For many years past, Government have endeavoured to encourage the planting of trees on private lands by the grant of such lands rent free or otherwise on conditions favorable to the holder.

In February 1864 the Board of Revenue, on a report from the Collector of Coimbatore, instructed all Collectors to endeavour in every village to set aside a plot of land selected from the waste, for the formation of a village tope, to be raised by the aid of the local Jungle Conservancy Fund and the joint labor of the villagers, and directed that the land so reserved and planted should be registered in the accounts as a public tope, a joint or Samudayem patta being issued for it in the name of the village community.

It was intended that such public topes should be maintained by the villagers, and should be used for the benefit of the village community as market-places, or camping-grounds.

This measure did not meet with success, and the Board of Revenue, two years later, reported to Government that, owing partly to want of funds, but mainly to apathy, the people had availed themselves of the proposed concessions to a very small extent only.

In South Arcot, however, owing to the exertions of Mr. Whiteside, the then Sub-Collector, a number of villages (87 in one year) in the southern part of the district agreed to plant village topes, and apparently did so plant them. A large number of palmyras were also planted under tank bunds in that district. The Board directed that efforts should be made to obtain more satisfactory results, and the Government supported this order. No information is available as to what was subsequently done in connection with this scheme.

101. Standing Order No. 7 of the Board of Revenue, which is based upon orders passed between 1848 and 1869, contains the following instructions regarding the planting of trees by individuals and communities :—

First.—Persons who may desire to plant topes for the public benefit may obtain land for that purpose free of assessment, may cultivate the land until the trees have grown up, and may use the produce of the trees for charitable purposes.

Second.—The produce of avenues planted by persons or village communities may be enjoyed by them free of tax.

Third.—Persons who may wish to plant topes and trees for firewood for their own benefit, are allowed to take up waste land for the purpose on

kowl free of assessment for twenty years, on condition that, on pain of resumption, a certain proportion of the land thus granted is planted annually, and that the whole area is planted up within five years, the full assessment being charged after the expiration of twenty years, unless an exceptional rate is adopted in consideration of the sterility of the soil. For Casuarina and other fast-growing trees the period for which the land was to be held free of assessment was subsequently reduced to ten years, but was again made twenty years by an order of the 18th January 1881. Nominally security is required for the payment of full assessment in case the conditions are not observed. This condition however is, I understand, as a rule not insisted upon.

102. Under the last-named rule large areas have been taken up for Casuarina plantations on the coast in Chingleput, both north and south of Madras. The wood fetches from Rs. 5 to Rs. 7 a ton, and these plantations on the coast are exceedingly productive, the annual yield varying, according to the information which I have been able to gather, from 2 to 6 tons per acre. These plantations therefore are exceedingly profitable, and, under these circumstances, it is not surprising that large areas have been planted up. As a rule Casuarina plantations near the coast are cut before they are fifteen years old, and in some cases the land has been thrown up after the crop had been taken from it. Under these circumstances it is for consideration whether the maintenance of the favorable conditions is right or expedient. The grant of land, free of assessment, for a term of years would be justified in the case of plantations which require a long series of years before they yield any income. In the case of Casuarina plantations on the coast those who have been so fortunate as to obtain land under these rules are acquiring wealth on very easy terms. As a matter of fact large areas in Chingleput have been planted, and are being planted, with Casuarina on land which pays assessment.

Some land has also been taken up under this rule for Casuarina planting in South Arcot and Nellore, but the success of the measure has been confined to those localities where the establishment of such plantations is an easy task, not attended by risk of failure, where the growth is rapid, the prices realized by the sale of the wood high, and the demand certain.

Under other and less favorable circumstances the rules have had no effect, and the people have not availed themselves of the concessions offered to them. Even on the Nílgiris, where land was offered for firewood allotments near the three settlements of Ootacamund, Coonoor, and Kótagiri, under rules similar to those here mentioned, small areas only were taken up, and most of the grants were resumed, because the conditions of the grant had not been fulfilled. In this district the rules have been cancelled, because private plantations of Australian trees, made independently of them, have answered so well, that the special concessions were rendered unnecessary.

103. Sections 29, 30, and 31 of the Forest Act empower Government under certain defined circumstances, and for the public benefit, to interfere with the management of private forests. My views regarding this important but very difficult subject, which received the support of the Forest Committee, will be found recorded in paragraphs 29 to 37 of the joint report of the 10th June 1882, printed as Appendix I to the present report. It is therefore unnecessary to enter into this subject in the present place.

Experience must show whether the provisions of the Forest Act are practicable. The point to aim at must be, in cases where the water-supply in rivers depends upon the maintenance and efficient protection of private forests, to induce the owners to entrust the management of such forests to Government, and to make such management so good and advantageous to the owners, that it shall be their interest to desire the continuance of such arrangements.

104. Section 32 has been inserted in the hope that Zemindars or other large proprietors, whose forests have been devastated by reckless cutting or otherwise, or who may desire to conserve them in order to protect the water-supply in rivers or for other purposes, may be induced to apply to Government for assistance in managing their forests.

Such assistance may be given in two ways—either by placing their forests under the general control of the District Forest Officer, or by the proprietors employing a separate officer who will carry out such regulations for the management of the forests as may be prescribed by Government. Obviously the success of this measure, as well as of forest administration generally in this Presidency, will depend entirely upon the agency at the disposal of Government to carry out such measures. It is not very material, whether such agency is employed under the control of the District Forest Officer or under the orders of the owner. But it is essential that the Forest Rangers and Foresters who are thus employed should have learnt their profession, and that they should possess the needful practical experience.

When professionally trained and experienced Rangers and Foresters are available for the charge of private forests, their owners will be found willing enough to avail themselves of their services. And it will doubtless happen in this Presidency, as it has happened in other parts of India, that the proceedings of the Government Forest Officers in the management of their forests will, if successfully carried out, be copied by adjoining landholders.

105. In this manner more good will, I am disposed to think, in the end be effected in improving the management of private forests than by enforcing Sections 29 and 30 of the Act.

It must not be imagined that satisfactory results will follow the passing of a Forest Act as a matter of course. The first condition of progress is to form an efficient staff, and to adopt a correct organization under which the Government forest and jungle in each district is managed. When this end has been attained, the example set by well-managed Government estates, yielding a good and steadily increasing revenue to the State, will induce private landholders to imitate the example thus set them.

CHAPTER II.

RAILWAY FUEL.

106. THE present consumption of firewood by the South Indian Railway is insignificant. During 1881 it amounted to only 4,453 tons, which was chiefly supplied from the hills between Trichinopoly and Madura. It was paid for by the railway at the rate of Rs. 4-8-0 per ton, and at that rate I understand that the railway would be glad to take large quantities every year. At remunerative rates it ought not to be difficult to arrange for the supply of a portion of the line; namely, in South Arcot and Madura, from the tank-beds stocked with babul (*Acacia arabica*), provided they are efficiently protected; in South Arcot, by planting Casuarina along the coast, and on low ground near some of the rivers; in Trichinopoly and Tanjore, by extending the plantations on *padugai* lands in the bed of the Cauvery and Coleroon rivers, and by improving the forests on the hills near the line as far as they are at the disposal of Government. In Chingleput private Casuarina plantations have been established on so large a scale, that the price of this wood must come down to the rate at which the railway will be ready to purchase it. In the Tinnevelly District the babul on tank-beds will probably all be required for local consumption, and large supplies could only be obtained from the ghát forests, in the event of an extension in that direction being constructed.

107. The question whether the South Indian Railway will be a large consumer of wood depends upon the price of coal, which at present is landed at rates as low as from 16 to 18 rupees per ton at several ports, particularly at Negapatam and Tuticorin. The relative value of coal and wood is, I understand, considered to be as 3 to 1. Accepting this proportion, wood at Rs. 6 per ton would be equivalent to coal at Rs. 18 per ton. At this rate it seems probable that considerable quantities of wood could be made available. However, as there are no definite data regarding the probable demand for wood fuel by the South Indian Line, I refrain from submitting further remarks on the subject.

Madras Railway.

108. The following statement, compiled from data furnished to the Conservator of Forests by the Consulting Engineer for Railways, shows the localities from which the fuel used on the Madras Railway was obtained in 1881, distinguishing between Government and private lands:—

Sources of Supply.		Quantity in Tons.	Place of Delivery.	Rates paid including Seigniorage.
				Rs. A. P.
	Nizam's Dominions.			
Private	Raichore, 350th mile	2,550	Raichore, 350th mile	7 0 0 to 8 0 0
	Bellary.			
Private.	Gooty, 257th mile	320	Gooty, 257th mile	7 0 0
	Adóni, 307th mile	800	Adóni, 307th mile	8 0 0
	Total	1,120		
	Cuddapah.			
Government.	Kódúr, 109th mile	850	Kódúr, 109th mile	5 0 0 to 5 6 0
	Pullampet Taluk, 98th to 140th mile	4,500	Cuddapah, 161st mile	..
	Do. 98th to 140th mile	880	Kondápuram, 210th mile	..
	Do. 98th to 140th mile	2,440	Gooty, 257th mile	..
	Do. 98th to 140th mile	190	Bellary, 305th mile	..
	Total	8,860		
Private.	Kódúr, 109th mile	1,030	Cuddapah, 161st mile	4 12 0
	Do. 109th mile	770	Kondápuram, 210th mile	4 12 0
	Total	1,800		
	North Arcot.			
Government.	Mámandúr, 91st mile	2,000	Tirupati, 83rd mile	5 2 0 to 5 8 0
	Ambúr	750	Vellore, 80th mile	5 0 0
	Total	2,750		
Private.	Kangundi	7,200	Kuppam, 170th mile, Bangalore Branch	4 10 0
	Kálahastri and Kárvetnagar	12,500	Tirupati and Puttúr	5 8 0
	Vellore, 80th mile	3,740	Vellore, 80th mile	4 8 0
	Total	23,440		
	Mysore.			
Private	Bangalore, 216th mile	850	Kolar road, 175th mile	4 10 0
	Salem.			
Government.	Mallápuram, 180th mile	650	Mallápuram, 180th mile	5 0 0
Private.	Vániyambádi, 122nd mile	1,700	Vániyambádi, 122nd mile	4 10 0
	Pothanur and Asampatti	4,100	Jalárpet, 132nd mile	4 10 0
	Mallápuram, 180th mile	4,950	Mallápuram, 180th mile	4 6 0
	Total	10,750		
	Coimbatore.			
Government.	289th mile near Sómanúr and Súlúr	400	Salem, 207th mile	5 2 0
	Malabar.			
Private.	315th to 330th mile, Wálayár nearly to Pálghat	1,500	Erode, 243rd mile	4 0 0
	315th to 330th mile, Wálayár nearly to Pálghat	8,500	Pothanur, 301st mile	4 2 0
	Parli, 337th mile	3,700	Pálghat, 332nd mile	3 6 0
	Shoranur, 359th mile	1,350	Shoranur, 359th mile	4 0 0
	Do. 359th mile	200	Beypore, 406th mile	4 0 0
	Total	15,250		

Abstract.

—	Government.	Private.	Total.
	TONS.	TONS.	TONS.
1. Nizam's Dominions	..	2,550	2,550
2. Bellary	..	1,120	1,120
3. Cuddapah	8,860	1,800	10,660
4. North Arcot	2,750	23,440	26,190
5. Mysore	..	850	850
6. Salem	650	10,750	11,400
7. Coimbatore	400	..	400
8. Malabar	..	15,250	15,250
Total ..	12,660	55,760	68,420

109. It will be noticed that out of a total supply during the year of 68,420 tons, only 12,660 tons came from Government forests, the rest being drawn from private lands. Of the Government supply, the forests in the Kódúr valley, of the Cuddapah District, yielded 8,860 tons, while 2,750 tons were obtained by cutting in the Mámandúr and Ambúr reserves of North Arcot. The Government forests in Salem and Coimbatore furnished only a few hundred tons each.

Of the private sources of supply, the North Arcot forests were the most important, as they yielded 23,440 tons, half of which came from Kálahastri and Kárvetnagar, while 7,200 tons came from the Kangundi Zemindari. In Salem 10,750 tons were brought from the lands of Mittadars between Mallápuram and Jalárpet. In Malabar 15,250 tons came from the Pálghat private forests. In the Bellary District 1,120 tons were the produce of village topes and jungles, chiefly in the taluks of Tadpatri, Gooty, and Adóni. Lastly, 2,550 tons were brought from the jungles in the Nizam's Dominions and delivered at Raichore.

The Conservator, Major Campbell Walker, informs me that in the Salem District, and perhaps in others, much of the supply stated to come from private forests is in reality cut on Government land, and that the Forest Officers have neither the establishment nor the power to prevent this.

110. Wood is burnt on the whole inland portion of the line, beginning at a distance of about 50 miles from both Madras and Beypore, or over a total length of 756 miles. The consumption is estimated at 100 tons per mile, which would make the average annual requirements 75,600 tons.

During the five years ending December 1877, the mean annual consumption of wood amounted to 71,000 tons, at an average cost of Rs. 4-14-3 per ton, and the mean annual consumption of coke, coal, and patent fuel amounted to 12,000 tons, at an average cost of Rs. 28-2-11 per ton (G.O., No. 373, Railway, dated the 26th April 1878). According to Mr. Danvers' report on Railways in India for 1881-82 the quantity of coal and patent fuel consumed in 1881 was 5,460 tons, and the average cost at point of delivery Rs. 21 per ton.

In a letter of February 1878 the Agent of the Madras Railway stated the approximate requirements of wood-fuel as follows :—

	TONS.
Shoranur, Pálghat, Pothanur	14,500
Salem, Mallápuram, Jalárpet, Kuppam, Bangalore, Vániyambádi...	30,000
Arkónam, Tirupati, Kódúr, Cuddapah, Kondapuram, Gooty ...	43,500
Raichore	3,000
Total ...	91,000

This estimate provides for increase of traffic, and will be taken as the basis of the following remarks. The fuel is delivered by measurement, and 68 cubic feet stacked are reckoned as equivalent to one ton of 2,240 lbs. The dimensions required are pieces 18 inches long by from 3 to 9 inches diameter. A small proportion (10 per cent.) of smaller wood for lighting is taken at reduced rates.

Sources of Supply.

111. The first question to be discussed is, what arrangements should be made to secure the permanent annual supply of 91,000 tons of locomotive fuel. So much has been established beyond doubt that the private forests near the line in the districts of Cuddapah, North Arcot, and Salem have been much overworked, and that under the existing management they cannot be expected to continue to yield at the present rate. The same result may be anticipated in regard to the topes and village jungles in Bellary and Anantapúr. The quantity obtained from private sources in these five districts during 1881 aggregated 39,660 tons. What their yield will be in future it is impossible to say, but it would not be safe to expect more than one-half of the present yield as a permanency. It is different in Malabar, where the climate is moist and the area of private forests very extensive.

112. Assuming that 20,000 tons a year may be expected from private lands in the districts of Salem, North Arcot, Cuddapah, Anantapúr, and Bellary; and assuming also that the yield of the private woodlands in Malabar and Mysore and of those in the Nizam's territory will remain the same as at present, we may frame the following estimate of the annual supply:—

	TONS.
From Mysore	850
Do. Nizam's Dominions	2,550
Do. Private forests in Malabar	15,250
Do. Private forests in Cuddapah, North Arcot, Salem, Bellary, Anantapúr	20,000
Total ...	38,650

Obviously these figures are not of much value, as they are based upon the data of one year only, but they are sufficient to show that a large proportion of the annual supply must eventually be furnished from the Government forests. This result is not new; it has been recognized long ago, and accordingly measures were taken, as early as 1866, for the formation of fuel reserves.

The Conservator indeed assures me that his experience in the Salem and other districts has led him to the conclusion that, if the Government forests were efficiently protected, the private sources would be exhausted within a short period. Major Campbell Walker is of opinion that the private forests in most districts cannot be counted upon for a permanent supply.

Future experience may possibly prove that the Conservator is right, but it seems to me preferable to base the conclusions of the present report upon the assumption that private enterprize will continue to produce a certain supply, estimated at about 39,000 tons a year.

Action on the part of Government necessary.

113. It might be urged that Government ought not to concern itself at all with the supply of fuel to the railway, and that private enterprize, if sufficiently encouraged, would supply all that is wanted. Experience has however shown that in this business private enterprize cannot be relied upon. The Casuarina plantations on the coast near Madras, which yield a portion of the fuel-supply to that town, have been formed by private enterprize—European and Native. But that is an easy undertaking, the success of which is assured. The wood produced in these plantations fetches Rs. 6 a ton on the spot, and the retail price of firewood * in Madras during the three years ending 1880 has been as high as Rs. 12-7-0 per ton. In the dry inland districts of the Peninsula, the production of fuel is a difficult task; the price is low, and hitherto the experience has been that in such places private enterprize can be relied upon to destroy the forests, but not to replant them. In this as in other branches of public business in India it will probably be found that private enterprize is ready to come forward where the task is easy and profits are certain, but that in difficult undertakings, with uncertain profits, Government must take the initiative.

* Review of Forest Administration in the Provinces under the Government of India for 1879-80, page 35.

114. This result is not satisfactory, and it is necessary that sustained and judicious efforts be made by Civil and Forest Officers to induce private landholders to protect and plant. But at present matters do not look very hopeful in this respect, and until landholders have been induced to plant for the supply of inland towns, such as Salem, Coimbatore, and Cuddapah, where fuel fetches higher rates than are paid by the railway, and where there has been a steady demand for it of long standing, the railway fuel-supply will, I fear, mainly rest on the shoulders of Government. In the Salem District there are numerous Mittahs in the vicinity of the line, the hills and waste lands of which were at one time well wooded. All these are now denuded, and cattle and the fires of the hot season prevent the reproduction of the forest. At Salem town fuel fetches a much higher price than is paid by the railway, and is therefore brought from much greater distances, yet no attempt is made by private proprietors to plant or to protect. In North Arcot the line passes through the Zemindaries of Kangundi and Kárvetnagar, and close to those of Arni and Kálahastri. Most woodlands near the line on these estates have been exhausted, and no attempts are made to secure reproduction.

In the Cuddapah District, as well as in Bellary and Anantapúr, there are numerous Shrotriemdars who, if the rates paid by the railway were sufficiently remunerative, and if the production of wood were easier, would doubtless be glad to protect their waste lands and to plant. At present I have not been able to learn that anything of the kind is done on an adequate scale in these districts. I have no doubt whatever that as soon as the Forest Department have for some time successfully maintained the protection of the areas in their charge, and as soon as the adjoining landholders see that a permanent revenue from their forests and waste lands can be secured by efficient protection and planting, they will imitate the operations of the Forest Department, fire-trace their woodlands, make roads and plant. This has happened in other parts of India, wherever the operations of the Forest Department have been successful, and it will doubtless also come in this Presidency. But, as matters stand at present, we are not justified in building any plans upon the hope that private landholders in the dry inland districts of this Presidency will carry out the measures necessary to provide a sufficient supply of fuel for the railway. For the purposes of the present report therefore we will assume that we must look to the Government forests for a supply of 50,000 tons annually.

Existing Reserves and Plantations.

115. Reserves and plantations in the vicinity of the Madras Railway have been formed in the following districts :—

Districts.	Reserves.	Plantations.	Total.	Remarks.
	ACRES.	ACRES.	ACRES.	
Cuddapah	39,000	1,362	40,363	Includes several tracts demarcated in the Palkonda hills for the production of timber.
North Arcot	13,320	1,060	14,380	Includes the Napier reserve.
Salem	18,618	..	18,618	Includes 6,000 acres sanctioned, but not demarcated, south of the Shevaroy hills station.
Coimbatore	1,410	..	1,410	
Malabar	2,990	..	2,990	
Total ..	75,339	2,422	77,761	

I was doubtful whether to include the Chenat Nair forest in Malabar, which is situated on the hills north of Pálghat, and is, as the crow flies, only six to eight miles from that station. The Conservator, however, informs me that though in the dry season there is a cart-track over the paddy-fields, the forest is difficult of access in the rains. In a later communication he states that the destruction of private forests in the vicinity has been so great of late years that there is even now a sale of firewood from Chenat Nair. The area of the Government forest here is 10,240 acres. It has not been included in the above statement.

116. This statement of areas does not agree with the returns recorded in the Conservator's Report for 1880-81.* In paragraph 76 of that report the areas of fuel reserves and plantations near the Madras line are given as follows :—

—	Fuel Reserves.	Plantations.	Total.
	ACRES.	ACRES.	ACRES.
Cuddapah	..	982	982
North Arcot	5,617	1,060	6,677
Salem	11,286	..	11,286
Coimbatore	13,170	..	13,170
Malabar	2,990	..	2,990
Total ..	30,073	2,042	32,115

The reserves in Cuddapah, which in the previous year's report were entered under "Fuel reserves" as 33,281 acres, are excluded in the report for 1880-81. My figures for the Cuddapah reserves and plantations have been taken from the area entered on the maps of the Madras Survey, as explained in detail in that chapter of this report which relates to the Cuddapah forests. In North Arcot the difference is due to the inclusion by me of the Napier reserve, which is not classed as a fuel reserve in the Conservator's report; and in Salem, to the inclusion of 6,000 acres lately sanctioned. In Coimbatore, the Conservator apparently includes the three tracts near Mettapollium, aggregating 12,160 acres, and known as the H, K and M reserves. These tracts however, I understand, have been entirely abandoned, and they can no longer be classed as reserves.

117. It will be noticed that the 78,000 acres, which I conclude from the information available may yield fuel for the consumption of the railway, include a number of tracts which are not designated as "fuel reserves," and which were not originally intended for the supply of the railway. Being close to the line, however, it may reasonably be expected that part of their produce will be used as fuel by the railway. The distinction between "fuel reserves" and "forest reserves" has no practical value, and should now finally be abandoned. The produce of all areas taken in hand by the Forest Department, whether forests or plantations, must be utilized to the best advantage, and it will depend on circumstances and on the demand, which may vary from time to time, whether such produce will be used as railway fuel or otherwise. The object of the present remarks is not to discuss the question whether those areas which hitherto have been designated as "railway fuel reserves" are likely to suffice for the requirements of the line, but whether a sufficient area has been set apart within convenient distance from the railway, from which the needful fuel may be drawn if required. Under these circumstances the area above stated, viz., 78,000 acres, may be accepted as the nearest approximation which can at present be made.

Former estimates of yield.

118. The next point to be discussed is, what the yield of this area is likely to be. Regarding the probable yield of the fuel reserves and plantations, several able and elaborate reports have been written; but reliable data, upon which practically useful conclusions might be based, are as yet wanting. A most interesting report was submitted to Government by the Board of Revenue in their Proceedings of the 26th April 1875. In this report it was stated that experimental fellings made in the Salem reserves had given 12 tons an acre, and that natural reproduction would suffice to replace wood felled in the reserves within 12 or 15 years. From these data the Board concluded that, under a 12 years' rotation, one ton per acre per annum might safely be counted upon. On this assumption they based the calculation that, as 100 tons of wood annually were required for one mile of railway, 100 acres of fully-stocked jungle would suffice to supply one mile of line, and that, assuming wood to be burnt on the whole line, 85,700 acres, fully stocked, would be sufficient for the supply of the Madras Railway.

* In the Report for 1881-82, the area of plantations in Cuddapah is given as 986 acres, and that of reserves in Malabar as 3,017 acres. The other entries are the same as those of the Report for 1880-81.

119. It was further stated that the total area of fuel reserves available for the two lines—the Madras and the South Indian Railways—was 91,345 acres, or 143 square miles, corresponding to 53,118 acres fully stocked, and that the outlay on the formation and maintenance of these reserves, including land-rent, supervision and survey, with compound interest at 4 per cent. per annum, had amounted to Rs. 1,21,705. From this they calculated that it would cost Rs. 41,313 to produce 53,118 tons of wood, which was the estimated yield of 91,345 acres of fuel reserves. This amount was obtained as follows:—

	Rs.
Interest on Capital outlay (Rs. 1,21,705) at 4 per cent.	4,868
Maintenance	10,360
Supervision at 10 per cent. on maintenance	1,036
Measures in aid of reproduction in felled tracts at 8 annas per acre on 53,118 ÷ 12 acres	2,213
Land-rent on 91,345 acres at 4 annas an acre	22,836
Total ...	41,313

The cost of producing one ton of fuel was thus found to amount to 12 annas 5 pies. The Board of Revenue added that 3,784 acres had been taken up for plantations, which, when fully stocked, should be equal to 17 square miles (10,880 acres) of jungle. The cost of wood produced in plantations they found to be between Rs. 1-8-9 and Rs. 2-1-10 per ton, allowing interest on the outlay at 4 per cent. From these data the Board of Revenue concluded that the seigniorage charged by Government to the railway, viz., Rs. 2-4-0 per ton, was too high; and recommended that it be reduced to Rs. 1-8-0 per ton, which they said would leave an ample margin to cover any inaccuracies in the estimate made.

120. The Government of Madras, in passing orders on these proposals in July 1879, drew attention to the fact that the area of the reserves in Salem had, on survey, been found to be much less than was estimated by the Board of Revenue in their calculations, and, on the authority of the Conservator, they assumed the annual yield to be $1\frac{1}{2}$ tons per acre. The consumption of wood on the South Indian line being insignificant, the Government confined their remarks to the requirements of the Madras Railway, for which they accepted the Board's estimate of 100 tons annually per mile. Allowing for those portions on which coal was expected to be burnt, the Government came to the conclusion that, in order to supply the requirements of the line within the Madras Presidency on $675\frac{1}{2}$ miles, 45,032 acres of reserves would be required, while 51,896 acres had been already reserved. No orders were passed regarding the proposal of the Board to reduce the seigniorage.

121. In June 1875, Major Campbell Walker, when officiating as Inspector of Forests, reported to the Board of Revenue that a serious mistake had been made in measuring the area in the Salem reserves, upon the outturn of which the Board of Revenue based their calculations of April 1875, and from a detailed report submitted to the Board of Revenue by Colonel Beddome in February 1876, it appeared that the area cut over in 1875 had been 53 instead of 10 acres as reported. Additional fellings had by that time been made, bringing up the total area cut to 100 acres, the outturn of which averaged $4\frac{1}{2}$ tons per acre. From this, both Colonel Beddome and Major Walker concluded that, in their then condition, the annual yield of the reserves might be expected to be at the rate of one-third ton per acre on an average. Colonel Beddome expressed his opinion that, under conservancy, the reserves would gradually improve, and in time give a far more favorable return. He added that much of the ground was occupied by worthless shrubs and creepers, which it ought to be the aim of conservancy to eradicate.

122. At the same time Colonel Beddome submitted a report by Mr. Sheffield, the Deputy Conservator of North Arcot, who had cut over one acre in a reserve which had been protected for ten years, after having been cleared. The outturn of ten years' growth was 8 tons of engine fuel and 3 tons of small wood. From the results of this felling, and from measuring coppice growth of known age, Mr. Sheffield concluded that fifteen years would be a suitable length of rotation in a

firewood reserve, and that the probable outturn at that age would be 15 tons per acre, corresponding to an annual yield of 1 ton per acre.

In March 1876, Colonel Beddome submitted to the Board of Revenue a report by the Deputy Conservator of Forests, Cuddapah, on cuttings made in the Ballipalle reserves, the results of which were as follows :—

	Area.	How long protected.	Outturn per Acre.
	ACRES.	YEARS.	TONS.
Ballipalle, I	3	8	19·6
Do. II	3	4	11·6

Colonel Beddome explained that indiscriminate felling had been carried on more or less in both tracts before protection commenced, and that it was impossible to state the age of the wood cut by Mr. Yarde. He added that the Ballipalle reserves possessed a richer soil, and that the jungle was of finer growth than in any of the Salem or North Arcot reserves.

Probable yield of Reserves.

123. The following is an abstract of cuttings made in protected reserves, as far as I have been able to obtain reliable records of the outturn :—

District.	Reserve.	Since when protected	When cut.	Area cut in Acres.	Outturn in Tons.		Remarks.	
					Total.	Per Acre.	Extent of Clearing.	Reference.
1. Cuddapah..	Ballipalle, I ..	1867	1876	3	59	19·6	Saplings of reserved trees were left standing.	Board's Proceedings, No. 1025, 19th April 1876.
2. Do. ..	Do. II ..	1871	1876	3	35	11·6		
3. Do. ..	Kódúr Hill ..	1871-74	1880-81	135	1,919	14·25	Reserved trees left standing.	Deputy Conservator's Report No. 253, 11th July 1882.
4. Do. ..	Yerraguntlakóta.	1873	1880-81	155	958	6·25	Clearing not thorough.	
5. Do. ..	Vakaticónah ..	1874	1880-81	200	1,248	6·20		
6. North Arcot	Not stated ..	1865	1875	1	11	11	..	Board's Proceedings, No. 730, 14th March 1876.
7. Do. ..	Mámandúr ..	1871	1880-82	1,777	4,952	2·8	Seeding trees, saplings under 4" diameter, and redwood trees were left standing.	Deputy Conservator's Report, No. 209, 3rd July 1882.
8. Salem ..	Varigampatti or A Reserve.	1866-67	1876	100	455	4·5	A few standard seeders and timber trees left standing.	Board's Proceedings, No. 730, 14th March 1876.
9. Do. ..	Do.	1866-67	1875-79	* 886	2,255	2·8	Reserved trees left standing.	Deputy Conservator's Report, No. 227, 24th July 1882.
10. Do. ..	Morur or B Reserve.	1866	1882	100	384	3·8	..	
11. Do. ..	Pothur or E Reserve.	1868-69	1877-78	112	140	1·25	..	
12. South Arcot	Gingee Reserves.	..	1876	10	120	12	Only half was fit for railway fuel.	G.O., No. 304, 18th February 1881.

Since this statement was prepared, I have seen a report by Mr. Yarde, the Cuddapah District Forest Officer, of the 19th October 1882, stating that the clearing of 50 acres in two blocks in Ballipalle (I) had yielded the following quantities :—

	TONS.
Engine fuel	447
Lighting wood	65
Loppings and branch-wood, 200 cart-loads = ...	50
Total ...	562

* The 100 acres cut in 1876 form part of the 886 acres cut in 1875-79.

corresponding to an outturn per acre of—

	TONS.
Engine fuel	9
Total wood	11

A few trees of red sanders and other kinds were left standing.

This forest has been protected since 1867, but nothing is known regarding the age of the portion cut.

124. With few exceptions these data only give the quantity standing on imperfectly stocked areas, but give no information regarding the age of the forest or the quantity produced annually. The exceptions are the two plots cut in North Arcot. The one-acre plot has already been mentioned; it evidently was a very good piece, and no conclusions of a general nature can be based upon it. Regarding the cuttings in the Mámandúr reserve, Mr. Sheffield, the District Forest Officer, reports that the area was stocked as follows :—

	ACRES.
Bare	157
Four-fifths full	600
Full	1,020
Total ...	1,777

which he estimated as equivalent to 1,500 acres fully stocked. The reserve had been cut over in 1869-70, and was placed under protection in 1871. The cuttings commenced in August 1880 and were completed in May 1882, the outturn being—

	LBS.
Railway fuel	10,869,000
Branch-wood removed on license	224,000
Total ...	11,093,000

or 4,952 tons. Mr. Sheffield adds that seeding trees were left, also all saplings under 4 inches diameter, and all red sanders trees, which in parts were very numerous; and estimates that only half the growing stock had been removed.

125. These data justify the conclusion that, in a forest similar to Mámandúr, the growth of ten years will be sufficiently advanced to justify a cutting at the rate of 2·8 tons of wood fit for railway fuel per acre, leaving standing saplings and a number of the larger trees, including the more valuable kinds, for seed and shelter. And it is likely that after a second period of ten years, the forest will, if properly protected, be sufficiently advanced to permit a second cutting at the rate of 2·8 tons per acre.

The annual yield of a forest like Mámandúr may therefore be put down at 0·25 ton of wood fit for railway fuel per acre. In a forest fully stocked, the annual yield would, according to the data furnished by Mr. Sheffield, be 0·33 ton per acre.

Relying on these data and on what I have myself seen of the forests in the Cuddapah District, I am inclined to think that the reserved forests in North Arcot and in the Pullampet taluk of Cuddapah may be expected to yield a quarter ton of wood per acre annually.

In the more dry climate of the Salem District, I feel assured that one-fifth of a ton per acre per annum is the outside that can be expected. In the moister climate of Malabar and the Sholakarai reserve of Coimbatore, which adjoins Malabar, half a ton may probably be expected as the annual yield per acre.

126. The other entries in the above statement are not, however, entirely without value. The quantity of wood standing on a certain area in a natural forest justifies certain general conclusions regarding the quantity that may be cut annually, though the age of the growing stock cannot be determined. The total area and outturn of entries 1 to 5 (Cuddapah), and of entries 9 to 11 (Salem) is as follows :—

—	Area in Acres.	Outturn in Tons.		Estimated Annual Yield in Tons.
		Total.	Per Acre.	
Cuddapah	496	4,219	8·5	0·25
Salem	1,098	2,779	2·5	0·20

At first sight it might seem that the annual yield of the Cuddapah forests should be assessed at a much higher rate. But it happens that the places where cuttings were made comprised some exceptionally heavy and well-stocked forest, while the rest of the reserves is poorly stocked. The Conservator is of opinion that the cuttings made in the Salem reserves were in many cases mere thinnings, leaving a large quantity of wood standing.

127. The rates at which it will, in my opinion, be safe to assess the yield of the reserves in the different districts are not intended to express the total annual yield in wood, but of that portion only which is likely to be utilized as railway fuel. This, I admit, is not a very scientific way of putting the case, but, in the absence of all precise data, no useful object would be gained by clothing my conclusions in scientific terms, which are not supported by sufficient data. The total yield in wood and timber will, it is hoped, be larger.

The estimate of one ton per acre framed by the Board of Revenue in 1875 was based upon data which were not correct; that made in 1879 by the Government of Madras of 1½ tons per acre was apparently only based upon a general expression of the Conservator's opinion. Major Walker's estimate of one-third of a ton per acre comes nearer the mark, but it is not supported by any definite data.

Save in plantations, the data upon which to base an estimate of the future yield of a forest, such as those to which the present remarks relate, are not easy to obtain. The growing stock in these natural forests is not uniform in age, but contains trees of all ages. The natural forests are most unequally stocked, and contain extensive blanks and open spaces, and they have not grown up under the same conditions, as regards protection and treatment, under which it is proposed to place the reserves, which are to yield the fuel-supply of the future. A good system of collecting the data upon which to base an estimate of the future yield of these areas must now be set on foot. Meanwhile the only safe plan is to accept a low estimate of the future yield in the reserves sanctioned and proposed to be formed.

Probable yield of Plantations.

128. So far regarding the yield of reserves in the districts named. The plantations in the Cuddapah District cannot, under existing circumstances, be assessed at a much higher rate than the reserves in the same district. The wood production in the Kódúr red sanders plantation is high, as explained in the Cuddapah portion of this report, but the locality is exceptionally favorable. For the present I will assess the annual yield of these areas at 0·5 ton per acre. But the Casuarina plantations in North Arcot, most of which are in the bed of the Pálár river, may reasonably be expected to yield much larger quantities. The yield of the private Casuarina plantations on the coast in the Chingleput District, the produce of which furnishes part of the fuel-supply to Madras is, according to the data collected by me on the spot, between 2 and 6 tons per acre per annum, and they are cut when from five to fifteen years old. Regarding inland plantations the following data are available. In South Arcot the outturn of Casuarina plantations, six years old, was in 1875 estimated at 50 tons per acre, equivalent to an annual yield of 8·3 tons per acre. In the Trivellum plantation in the same district, eight years old, 200 acres cleared in 1876 gave an outturn of 15 tons per acre, which is equivalent to an annual yield of 1·8 ton per acre. This plantation, however, had been injured by floods. At the same time Mr. Sheffield estimated that in the Keelminnel plantation he would, after eight years, obtain an outturn of 50 tons per acre, corresponding to an annual yield of 6·25 tons. In a letter of the 25th March 1876 to the

Board of Revenue, Colonel Beddome stated that, after making a liberal allowance for floods and bad seasons, the average annual yield for Casuarina plantations in North Arcot might be taken as 2·85 tons per acre.

129. The following is a detailed account of the Benganúr Casuarina plantation made in a tank-bed in the Kolár District of Mysore, which has been furnished to me by Mr. D. E. Hutchins, Deputy Conservator of Forests, Mysore :—

BENGANUR CASUARINA PLANTATION.

Age seven years.

Sample area 1·356 acres. Reducing factor 0·6.

Number of Trees in each Class.	Girth at 6 feet in Inches.	Height in Feet.	Cubic Contents	
			Of one Tree, Cubic feet.	Of Class, Cubic feet.
35	6	23	0·27	9·45
53	8	29	0·61	32·44
65	10	31	1·03	66·69
84	12	35	1·67	140·11
92	14	36	2·33	214·73
82	16	38	3·22	264·20
53	18	42	4·51	239·14
32	20	42	5·57	178·18
12	22	48	7·70	92·38
3	24	50	9·55	28·64
1	27	50	12·08	12·08
Total .. 512	..	..	..	1,278·04

Brief account of Plantation.—Elevation 2,660 feet. Rainfall 31 inches. A piece of lowlying ground about 8 acres, in the waterspread of a tank and below another tank in the catchment area of the Pálár river, liable to be flooded for a short time. About a mile from the Kolár road station of the Madras Railway. Soil, chiefly silt, moist, sandy, with a subsoil of clay at varying depths. The ground under the trees clean, free from grass and weeds, covered with a thick layer of matted casuarina twigs. Planted out during the rains of 1872 at 10 feet apart from nurseries into pits one yard cube. In February 1879, 378 trees to the acre. Ground covered completely with dense shade. Thick branches nearly down to the ground ; hence the reducing factor taken at 0·6. The measurements were made in February 1879, when the trees were seven years old from seed. Hence the mean annual production was 134·64 cubic feet per acre. Taking 56 lbs. per cubic foot, or 40 cubic feet to the ton, this would be at the rate of 3·36 tons per acre per annum.

It seems to me that taking into account good and bad soil, as well as failures, the annual yield of the plantations made in the bed of the Pálár river may be safely assessed at 2 tons per acre.

Total Yield.

130. Accepting these estimates the following will be the quantities which may be expected from the area of the existing and sanctioned reserves and plantations :—

—	Area in Acres.	Estimated Annual Yield in Tons.	
		Per Acre.	Total.
1. Cuddapah and North Arcot reserves ..	52,320	0·25	13,080
2. Cuddapah plantations	1,362	0·5	681
3. North Arcot Casuarina plantations ..	1,060	2·00	2,120
4. Salem reserves	18,618	0·20	3,723
5. Coimbatore and Malabar reserves ..	4,400	0·50	2,200
Total ..	77,761	..	21,804

From these figures it will be seen that reserves and plantations must be extended considerably in order to secure a yield of 50,000 tons a year. Regarding these extensions, I have come to the following conclusions, after examining the circumstances of each district.

Extensions proposed.

131. In Bellary, Anantapúr, and Kurnool there is no prospect of reserves being formed for the supply of the Madras Railway. The produce of the Sandúr forests, which have lately been leased by Government, will most probably all be required for the supply of Bellary, for iron-smelting, for sugar-boiling in the country between those hills and the Tungabhadra river, and for the Bellary-Dharwar Railway. Plantations of babul and other trees might be formed on waste lands near the Madras Railway, but it may be hoped that the high prices paid by the railway in these districts may induce private enterprise to come forward. As regards babul, which is readily grown on black soil, there is this difficulty, that the Madras Railway refuse to take it. The Conservator informs me that the South Indian Railway prefer babul to any other wood. In these districts, the action of Government must be guided by further experience, and I am not prepared to submit any proposals at present.

132. In Cuddapah and North Arcot an effort should be made to extend the reserves to 100,000 acres. The Casuarina plantations in North Arcot should be extended as far as suitable land can be made available, and it probably will be possible to extend them up to an area of 2,000 acres. In the Cuddapah District also an effort should be made to extend the plantations near the line up to 2,000 acres. The system of large pits (1 yard cube), which has been so successful in Mysore, should have a trial in this district. In Salem, efforts should be made to extend the reserves to an area of 50,000 acres. These are the chief extensions regarding which I am in a position to submit definite proposals, and, if they are accepted, the following quantities may be made available for the railway :—

—	Area in Acres.	Estimated Annual Yield in Tons.	
		Per Acre.	Total.
1. Cuddapah and North Arcot reserves ..	100,000	0·25	25,000
2. Cuddapah plantations	2,000	0·50	1,000
3. North Arcot Casuarina plantations ..	2,000	2·00	4,000
4. Salem reserves	50,000	0·20	10,000
5. Coimbatore and Malabar reserves ..	4,400	0·50	2,200
Total ..	158,400	..	42,200

133. So much is certain that these proposed extensions are not extravagant. Regarding the expenditure incurred on these reserves and plantations up to the 31st of March 1881, I have gathered the following data from the Annual Report for 1880-81 :—

—		Area in Acres.	Expenditure.	Receipts.	Net Outlay.
			Rs.	Rs.	Rs.
Reserves ..	Cuddapah	33,281	37,943	3,991	33,952
	North Arcot	5,617	7,161	4,030	3,131
	Salem	11,286	32,040	7,396	24,644
	Coimbatore	13,170	19,102	4,279	14,823
	Total ..	63,354	96,246	19,696	76,550
Plantations ..	Cuddapah	982	44,303	491	43,812
	North Arcot	1,060	60,465	30,040	30,425
	Total ..	2,042	1,04,768	30,531	74,237

General establishment charges are apparently not included in these figures, but even if we add a liberal allowance on that account, the outlay is moderate. With the existing uncertainty regarding yield, I refrain from submitting any calculations to determine the question whether the maintenance and other charges, *plus* interest on the capital outlay, will be covered by the annual yield of these areas.

Eventually, when the annual yield has been determined by actual experience, such calculations must be made; but at present they would not lead to any practically useful results. The best safeguard, financially, in these undertakings is, that the expenditure incurred for the formation and maintenance of reserved forests is defrayed from current forest revenue.

Mode of Working.

134. It will, however, be necessary to keep most careful accounts of the yield, and of the financial results of managing these forests, the chief produce of which is used as railway fuel. Everything seems to point to a short rotation for the working of these forests, the reproduction being chiefly from coppice. Hence the system of working will be very simple, and all that will be required is to keep an accurate record of the area cut over, and of the quantity obtained, with an estimate of the wood left standing. It will be explained in the Cuddapah portion of this report that the system of making clearances in narrow belts, which are protected against excessive evaporation by the forest left standing on either side, should have a fair trial, combined with the dibbling in of seed or planting out from nurseries in the clearances, so as to secure a larger proportion of fast-growing and otherwise suitable species in the forests.

135. Having submitted suggestions regarding the area which requires to be demarcated in the different districts, it will now be necessary to consider the price paid by the railway and the revenue derived by Government from the fuel cut in the Government forests. The present practice is for contractors to cut in the localities assigned to them and to deliver to the railway at certain rates agreed upon. These rates do not include the amount due to Government on account of purchase-money or seigniorage, which is paid by the railway to the Forest Department direct. This amount, as a rule, is one rupee for 1,000 lbs., which is equivalent to Rs. 2-3-10 per ton. But when the late cuttings were made in the Cuddapah reserves, which are close to the railway line and are better stocked than the open forests, the Forest Officer arranged with the contractor that higher rates should be paid. These rates were to be for the Kódúr hill reserve Rs. 2-8-0, and for Vakaticónah and Yerraguntlakóta Rs. 3 per ton. It had been agreed between the Forest Officer and the contractor that these higher rates should fall upon the contractor, who would save in carriage and otherwise; but the result was, that these higher rates were objected to by the Agent of the Madras Railway.

136. The cost to the railway of the fuel delivered in 1881 from different sources is detailed in the statement entered in paragraph 108. It will be noticed that the highest rates were paid for the wood obtained locally in the Bellary District and at Raichore, where the rates varied between Rs. 7 and Rs. 8 per ton. The wood brought from the Government forests of Cuddapah and North Arcot cost from Rs. 5 to Rs. 5-8-0, that brought from private forests in these districts cost from Rs. 4-8-0 to Rs. 5-8-0. The Mysore wood cost Rs. 4-10-0, that from private forests in Salem ranged from Rs. 4-6-0 to Rs. 4-10-0, while that delivered at Mallápuram from Government forests cost Rs. 5 per ton. A small quantity of Government wood in Coimbatore was delivered at Rs. 5-2-0 per ton, while the private wood from Malabar cost only from Rs. 3-6-0 to Rs. 4-2-0.

So much is clear from these figures, that, with the exception of the northern end of the line, the wood brought from private forests costs less than that brought from Government forests.

137. Under these circumstances it seems to me that the policy which should be followed at present is, to encourage as much as possible the supply to the railway from private sources. It is more economical for the railway, and it is the one most likely to induce private proprietors to consider the advantage of protecting their

forests and planting. At the same time this plan will have the great advantage that the reserved forests in the vicinity of the line will have a few more years' protection, the result of which cannot but improve their productive powers.

It is not, however, likely that the whole of the supply required by the railway can at present be drawn from private forests, and we must therefore consider the best plan for regulating the supply from the Government forests. As regards the open forests not included in the existing reserves, there is no objection to the continuance of the present plan, with this provision, that no cuttings be made, if possible, in tracts likely to be included within reserved forests.

138. As regards cutting in reserves, it has been said that this should be delayed as long as possible. There are, however, certain localities where cuttings may be made with advantage. Such are the forests on level ground at Ballipalle, which, thanks to protection, have become thickly stocked, and which should be cut in the manner suggested above. Whenever cuttings are made in reserves, an effort should be made to introduce the plan of selling the wood standing. The compartment where the cutting is to be made should be marked off on the ground by temporary but conspicuous marks, and the rules which should regulate the cutting in regard to the saplings and trees to be left standing and otherwise, should be clearly laid down and strictly enforced.

139. Eventually it will be possible to sell the standing wood in a given compartment at a certain rate per acre, to be determined either by private bargain or by tender. This is the object which should be worked up to, but it will take some time before contractors learn to estimate the wood standing in a certain compartment with sufficient accuracy to make an offer per acre. Hence at first it will probably be necessary to agree upon a certain rate to be paid per cart-load, or, when there is no cart-road, per bullock-load. The purchase-money to be paid by the contractor should include seigniorage, and, to facilitate its payment, instalments may be agreed upon to be paid as the wood is removed.

140. I cannot urge in terms sufficiently strong that the growth of a class of substantial contractors or middlemen should be encouraged. It is not the business of the Forest Department to carry the wood to the railway, and it will be found much more convenient to let the whole transaction, from beginning to end, be in the hands of these middlemen. It is the plan which is followed in the case of wood brought from private sources, and if adopted in the case of the Government forests will, I feel sure, obviate much correspondence. The present plan under which the railway deals both with the Forest Department and the contractor is said to have worked well while there was an abundant supply of wood on Government and private lands, but under existing circumstances it has led to inconvenience.

Conclusion.

141. The suggestions here submitted amount to this: that at present the railway should be encouraged to draw as much wood as possible from private forests; the supplies from this source in the inland districts will probably diminish, and as they diminish, the requirements must be met to a greater extent from the Government forests. In order to make my meaning clear, I have, in the preceding paragraphs, put forward some figures, which may be summarized as follows:—

—	Private.	Government.	Total.
	TONS	TONS.	TONS.
Supply in 1881	55,760	12,660	68,420
Future supply	39,000	42,000	81,000

Should the efforts fail, which must be made to induce private landholders to preserve and plant with the view of supplying the railway, the supplies from private sources would probably diminish further; but as they decrease, the condition of the Government forests will improve and consequently their productive powers will increase. This relates to the inland districts. On the east coast the private

Casuarina plantations are so extensive, chiefly in Chingleput, that the price of this wood must fall, and it may eventually pay the Madras Railway to burn it.

142. Should the extensions here suggested be found to be insufficient to supply the requirements of the railway, the further experience which will then have been gained will doubtless show the way to the measures required to meet the case. The Kurnool-Cuddapah canal is navigable from August to January, and the question should be studied in detail, whether wood from the Nallamalais in Kurnool and the Lankamalais in Cuddapah can be brought down the canal to Krishnapúram on the railway at remunerative rates. The floating of wood down the Cauvery has been tried and been found to fail, but plantations near the line in the vicinity of the Cauvery or other rivers might be made; the former reserves near Mettapollium might be re-established, or suitable tracts on the Nílgiri slopes, near the Mettapollium terminus, might be placed under strict protection. If a railway is constructed to Ootacamund, the plantations of Australian *Eucalyptus* and *Acacia* on the plateau should be extended largely and might furnish a large supply. So much has been established by the researches recently made by Mr. Hutchins, that these plantations can be made to furnish a mean annual yield of 6 tons per acre, good and bad included. Under these circumstances it is not at all impossible that, if these plantations can be made and maintained at a reasonable outlay and if the needful land can be obtained, the blue gum grown on the Nílgiris may some day contribute to the fuel-supply of the Madras Railway. If suitable land can be made available on the plateau of the Shevaroys, an experimental plantation of Australian trees should be made. *Acacia melanoxylon* as well as some species of *Eucalyptus* seem to thrive at Yercaud. At present it would be premature to enter further into these schemes. It will be time enough to consider them when necessity arises for doing so. It has been recommended to encourage the use of coal in the place of wood on the Madras Railway, in order to guard against the destruction of the forests. Such recommendations are not based upon a correct appreciation of the case. In the interests of forest conservancy it is most desirable to encourage the consumption of wood by the railway. Forests are useful in many ways, besides producing a supply of wood and timber. But forests cannot be maintained without some return of revenue from them. Thus, if the Madras Railway finds it profitable to burn wood in preference to coal, this will cause an increased demand for wood, which will enable Government to maintain, under efficient protection, a larger area of State forests than would be possible if the produce could not be sold.

143. In the preceding remarks I have not adverted to Indian coal as a possible rival of wood-fuel. It is not impossible that when the system of coast canals has been completed from the Húgli to Madras, or perhaps even sooner, Bengal coal may compete at Madras with English and Australian coal. And when the coal-fields in the Nizam's territory have been connected by tramway with Bezváda on the Kistna river, it is probable that Singaréni coal may be delivered at less cost at Madras than sea-borne coal. But considering the quality of the Singaréni coal, and the large quantity of ash which it contains, it seems doubtful whether, under existing circumstances, it can be landed at Madras at rates sufficiently low to enable the railway to dispense with wood-fuel in the inland districts of the Presidency.

CHAPTER III.

FORESTS AND IRON.

144. No part of India is richer in good iron ores than the Madras Presidency, and in most districts there are the remains of a large old iron industry. The famous Wootz or Indian steel made in crucibles is manufactured in Mysore and in some of the adjoining districts of Madras, and native-made iron is to this day preferred by the people for many purposes to the cheaper iron from England. And

there seems good ground for believing that certain classes of iron can be made of a better quality from the materials available in the Salem and other districts than they can be produced in England. In many places the old native iron-smelting industry has died out through the competition of iron from England, and through the gradually-increasing scarcity of fuel. Mr. R. Bruce Foote, in a note on the magnetic iron ore of Kanjamalai near Salem,* correctly states that it is owing most likely to the greatly-increased price of charcoal that the number of native iron-smelting furnaces in the Salem District has decreased of late years. Mr. Foote informs me that in 1878 he noticed considerable traces of an old iron-smelting industry in the south of the Puducottah State, where rich hematitic laterite occurs very largely, but could hear of no smelting in progress. He adds, "the once extensive forests are now reduced to profitless scrub. The same remarks apply to the lateritic tracts in the Sivaganga Zemindari in Madura. The great forests which harboured the rebel Poligars at the beginning of this century, and so greatly puzzled and hindered our troops, have left but very faint traces. Similar traces of a lapsed iron industry occur to the north-north-west of Cape Comorin, where the most southerly mass of the ghâts has been almost absolutely bared of forest."

Owing to the absence of coal in the Madras Presidency the future of iron-smelting is, in this part of India, almost entirely a forest question. The cost of sea-borne coal (Rs. 16 to Rs. 18 a ton) at the eastern ports would be prohibitive, and it is not likely that any Indian coal from Bengal, the Nizam's territory, or Central India could be delivered at rates sufficiently low to be used for iron-smelting in the Salem or other inland districts. Singaréni coal may perhaps be used to smelt the ores of the Nellore District. Mr. Foote has drawn my attention to the great and rich beds of magnetic ore near Ongole. Their position near the coast and the coast canals is a very favorable one, as the ore could be carried at very small cost to the neighbourhood of large fuel supplies—either mineral coal or the wood produced in the Casuarina plantations on the coast. But in most cases the future of iron-smelting in this part of India is entirely a forest question, and the difficulty is, that iron can only be made with charcoal, where the price of wood is exceedingly low.

145. Iron-making on a large scale has been attempted, with the liberal support of Government, on several occasions and in several districts, viz., at Porto Novo and Trinomalai in South Arcot, at Pulampatti in Salem, and at Beypore in Malabar. Large concessions were also given a few years ago to a commercial undertaking styled the Napier Foundry. Forests in North Arcot were assigned to it, but all these undertakings have come to an end.

Native Iron Industry.

146. There is, however, still a large native iron industry in existence, and in those chapters of the present report which relate to Bellary and Salem a detailed account will be found of what I have seen on my tour of the native iron furnaces in these districts, and the conclusions which I have formed regarding the measures which must be taken for the maintenance of that industry.

In this place it must suffice to state that one of the main objects of forestry in this Presidency must be the production of charcoal for iron-smelting, and this can only be effected by the formation and strict protection of reserved forests in the vicinity of those localities where iron is still made, or where the conditions for making it are favorable.

It must be made the special duty of the officers charged with the selection of the areas to be constituted reserved forests in the different districts to pay attention to this matter, and an officer of the Geological Survey, or a Metallurgist with practical knowledge of iron-making, should be associated with the Forest Officers in selecting the reserves proposed to be formed for this purpose. Meanwhile, and until the services of a special officer can be obtained for this purpose, I would suggest that, with the consent of the Government of India, the officer of the Geological Survey who is employed in this Presidency should give his advice to the Forest Officers engaged in selecting reserved forests in the iron-smelting districts.

* Memoirs of the Geological Survey, Vol. IV, 1864.

147. Ball, on page 346 of his Manual of Economic Geology of India (1881), gives an account of the iron ores and iron resources of the Madras Presidency. Some additional facts will be found in the Bellary chapter of this report. There is hardly a district without iron ores, and in some the existing native iron industry is important. Foremost in this respect stand the magnetic iron ores of Salem, the hematite of the Sandúr hills in Bellary, and the ores which are found on the Nallamalais and Lankamalais, and which are worked up in a long string of villages at the foot of these hills, extending from Nandyál in Kurnool to Nandialampet in Cuddapah.

Future extension of the Industry.

148. Scarcity of fuel is the main difficulty. As regards the Sandúr hills in Bellary, Government have taken the first step in leasing 40,000 acres of land with the view of converting this area into forest, and as regards the other districts, the selection of reserved forests should, as much as possible, be made with special reference to the manufacture of iron. The difficulty is, that in most cases we are not justified in expecting any large annual yield of wood per acre from the areas which will be available for forest growth, and this I fear will prove the great obstacle to iron-smelting operations on a large scale being undertaken by private capital. There are however some notable exceptions to this rule. There are localities, on the coast, in beds of rivers and tanks, and on the hills, where the growth of planted wood is exceedingly rapid. The most remarkable of these instances is on the plateau of the Nílgiris. Here, owing to the climate which is so wonderfully favorable for the growth of the Australian blue-gum, some plantations produce as much as 12 tons per acre per annum, and on a large scale it will be possible, at elevations between 6,000 and 8,000 feet, to produce at the rate of 6 tons of wood per acre annually, corresponding to 1½ ton of charcoal; so that the produce of 2½ acres (3·5 tons of charcoal) may be expected to suffice to produce one ton of finished iron or steel annually. No reliable estimate can however yet be made of the cost of the wood produced at these plantations. The present high prices of wood and charcoal at Ootacamund or Coonoor are no guide. Should plantations on a large scale be systematically established, the cost of the wood may be greatly reduced; but it is very doubtful whether the charcoal could be produced so cheaply as to be used in iron-smelting. Should it be found feasible to produce charcoal at a sufficiently low rate, and should the blue-gum charcoal be found suitable for the purpose, the question would arise whether the deposits of iron ore found on the Nílgiris are sufficiently extensive to justify the formation of plantations on a large scale, or whether it would pay to bring up from below pig iron, made in the Salem District, to be converted into finished iron on the hills. These questions must be determined by a special inquiry.

149. A large yield of wood and charcoal may be expected to be obtained by planting Australian trees on other hill ranges; but nothing is known regarding the cost at which this might be done. Casuarina plantations in suitable localities on the coast of Nellore, Chingleput, and South Arcot, in moist sea air, are estimated to have an annual yield of from 2 tons to 6 tons per acre. The high prices which wood at present commands near the coast prohibits its use for iron-smelting. It is however not impossible that, owing to the large extension of Casuarina plantations, the price of wood may fall, so as to bring Casuarina charcoal within reach of the iron-smelter.

On low land near the banks of rivers and in tank-beds, Casuarina, babul, *Inga dulcis*, and other trees grow luxuriantly, and have doubtless a large wood production per acre, though the rate has nowhere yet been exactly determined. But such places are of limited extent, and the price of wood is too high to admit of its being used for iron-smelting.

150. The railways pay from Rs. 4 to Rs. 5 per ton of wood fit for locomotive fuel, say Rs. 4-8-0 on an average, and the price of wood in towns is much higher. At Rs. 4-8-0 for wood, charcoal could not be had for less than Rs. 25 a ton, and such a price would put the use of the charcoal for iron-smelting out of the question.

Casuarina on the coast and blue gum on the hills may eventually furnish charcoal sufficiently cheap for iron-smelting, but at present the only chance of profitably establishing iron works, worked by charcoal, on a large scale in those districts of this Presidency with which I am acquainted, is by utilizing the wood produced in forests remote from the railway and large centres of consumption. And in such localities there are two difficulties: the forests in such situations are generally exceedingly feverish, and the annual yield per acre, except in the evergreen forests of the Western Ghâts, will be very small and uncertain, until the forests have been efficiently protected, and particularly protected against fire, during a long series of years.

I am not myself acquainted with any localities where good iron ore is found in the region of evergreen forests along the line of ghâts, but the point should be kept steadily in view. At high elevations the evergreen forests have an exceedingly slow growth; an instance are the sholas on the Nílgiris. But at lower elevations, and with a higher temperature, the rate of growth will probably be found to be very satisfactory, and these forests have several great advantages. They are densely stocked and enjoy naturally complete immunity from fire. Moreover, as they consist of species which, while young, thrive in dense shade, natural reproduction, by a well-arranged system of cuttings, will not be found to be a difficult task.

Attempts made to smelt Iron on a large scale.

151. It will now be well to give a brief account of the attempts which have been made in this Presidency to carry on iron-making on a large scale. The data upon which the following narrative is based are taken, partly from the Manual of the South Arcot District by J. H. Garstin, C.S.I., partly from official records, and partly from information kindly collected for me by Colonel Shaw-Stewart, R.E.

In 1824, Mr. J. M. Heath, of the Madras Civil Service, started the idea of manufacturing bar-iron on a large scale, and his request to be granted the exclusive right of making iron in India, and a lease of the right of cutting fuel on Sirkar waste land, received the support of Sir Thomas Munro, the then Governor, and the Members of Council.

These proposals were not at that time accepted by the Government of India or the Court of Directors, but later, after Mr. Heath had resigned the Service, he went to England, and on the eve of his departing again for India, with the materials for commencing his undertaking, the Court of Directors granted him, during the remainder of their then current charter, the exclusive privilege of manufacturing iron on the European plan in the territories of the Madras Presidency. In 1830, he erected works at Porto Novo in South Arcot, and carried on these works by means of successive advances obtained from Government.

152. After the special concessions granted by the Court of Directors had expired, he obtained from the Collectors of the different districts, with the sanction of Government, leases for twenty-one years of the right of raising ore and cutting fuel on favorable terms, provided they were not inconsistent with the customs and usages of the country, and did not interfere with the rights and privileges of the natives. These leases were free for the first five years, and afterwards subject to the payment of a small annual rental. In 1833 an association, formed under the designation of the Porto Novo Steel and Iron Company, took over the business. Furnaces, forges and rolling mills were erected at Porto Novo, and similar works were afterwards established at Beypore in Malabar where the Company had obtained the lease of extensive jungles. They manufactured iron of a very superior quality, which sold readily in England and India at high prices, but they were only able to carry on the work by means of advances from Government. In spite of this assistance and of renewed concessions, the works did not pay, and no part of Mr. Heath's or the Company's debt was liquidated up to 1844.

153. In 1853 a new Company, called the East Indian Iron Company, was formed with a capital of £400,000. The Court of Directors gave up the claim against Mr. Heath, which in September 1849 amounted to Rs. 8,22,240, and accepted from the new Company £10,000 in full settlement of the debt of £16,000 due by the Porto Novo Company, giving them the exclusive right of getting ore from Government waste lands in South Arcot, Salem, Malabar, Canara, and Coimbatore for a term of thirty years, subject to an annual rent payment of £500.

154. On the formation of the new Company, fresh works were erected at Trinomalai in South Arcot and Pulampatti on the Cauvery river in Salem, twelve miles above Erode. Large quantities of a very superior quality of pig iron were sent to England; but owing to the difficulty of supplying the required fuel, and the difficulty of carrying on the laborious work of puddling and reheating on a large scale in a hot climate, they failed to manufacture wrought-iron upon a satisfactory commercial scale.

At the end of 1859, Mr. William Maylor, who had been appointed General Manager of the Company, proceeded to India, in order to introduce Bessemer's process of making steel. Ball (Economic Geology, page 349,) states, on the authority of Mr. Sowerby's account of a visit to Porto Novo in 1859, that pig-iron sent by them to England had commanded a good price for conversion into steel, and a large quantity of it was used in the construction of the Britannia tubular and Menai bridges. But the supply was not regular; hence the iron rarely realized remunerative prices. From one cause or other the furnaces were seldom at work for more than four months in the year, and the cost of management alone was thus raised from 10 shillings to 30 shillings per ton. Nevertheless Indian pig-iron was at that time supposed to be steadily making its way in Sheffield for steel purposes. At Beypore the works produced excellent steel by Bessemer's process.

155. But, though they succeeded so well experimentally, the business was not a commercial success. At Porto Novo, Mr. Sowerby reported that, owing to all the jungle having been cut down and the land cultivated, the charcoal had to be brought from a distance of twenty-five miles. At Beypore deficiency of fuel was supposed to be one of the causes of failure; there were no roads by which it might be brought from the inland forests where timber was abundant, and consequently it was actually imported from Ceylon. At Pulampatti the work was stopped in 1858, at Porto Novo operations came to an end in December 1866, and at Beypore and Trinomalai in February 1867.

In 1868 the attention of the Government of Madras was drawn to the matter, by an application to work iron ore in the Presidency without infringing the privileges of the East Indian Iron Company, and accordingly, on the 11th February 1868, the Government addressed the Secretary of State, reporting that the Company's operations had come to a stand-still, and that, owing to the non-fulfilment of its terms, the lease had become legally void. They justly represented that it was most objectionable that any grant of such exclusive privileges should be allowed to lie dormant and yet remain uncancelled, and be thus a hindrance to all other enterprize in the same direction, and they requested the Secretary of State to take the needful steps in the matter.

156. The result of the negotiations which ensued between the Secretary of State and the representatives of the Company was that, in June 1870, the Company surrendered the lease in consideration of a payment of £8,000 on account of compensation for losses, the surrender of the lease, and in payment for certain lands owned by the Company at Calicut. The deeds by which the surrender was effected were finally settled in August 1874.

Thus terminated an undertaking which, but for the fuel difficulty, might have been successful. Had Mr. Heath, and the Company which succeeded him, instead of relying upon the supply of charcoal brought from vast areas of jungle, concentrated their operations in this respect, had they obtained from Government the grant of sufficient areas of jungle in the vicinity of the works, and had they placed these areas under efficient protection and improved them by planting in suitable places, these areas might by this time have been converted into dense forest and their produce might have secured the success of the business. I say this might, but do not maintain that it would have been achieved; for such proceedings would have required professional skill and knowledge, continued outlay of money with very little return during a long series of years, and, most of all, great patience and steady perseverance in one line of action.

As it is, Government have been most fortunate in closing this business, and having their hands free for fresh undertakings, at a sacrifice which, as regards cash outlay, probably altogether has not exceeded £100,000.

157. It has often been maintained that in countries which depend upon charcoal for iron-smelting a limit is placed to the outturn from blast furnaces by the forests becoming so rapidly denuded.

But this is not the experience in countries where forests are managed in a systematic manner on correct principles, and where consequently each block yields the same quantity of wood annually without in any way deteriorating in its condition. But even under the most skilful management, a large area of forest is always required to keep large iron works continuously supplied with fuel. For instance, an establishment turning out 25,000 tons of finished iron a year (the quantity estimated for the projected Lohara iron works in the *Gazette of India* of the 5th August 1882) will, if working with charcoal only, require (at the rate of 3·5 tons of charcoal for one ton of iron) 87,500 tons of charcoal a year, which under first-rate management may be yielded by 350,000 tons of wood; and the area of completely-stocked forest which would be required to produce this would, if the annual yield per acre were half a ton, one ton, and six tons, respectively, be as follows :—

At half a ton per acre,	700,000	acres	or	1,094	square miles.
At one „ „	350,000	„	or	547	„
At six „ „	58,000	„	or	91	„

The annual yield of well-managed high forest in Europe, under favorable conditions, may be put down at about one ton per acre; but it will take many years' rigid protection before any considerable area of Government forest in the Salem District can be brought up to that yield.

An annual yield of six tons per acre, on a large scale, might be attained on the Nílgiris, if large plantations were established on the plateau, and if they were placed and maintained under perfect management. It is, however, most improbable that so large an area of suitable land could be made available on the Nílgiris for this purpose, even if the cost of the charcoal produced were not prohibitory.

The chief item of expense, where iron is made on a large scale, is the carriage of the wood or charcoal. When water-carriage is available, as at Hieflau in Styria, where the logs are floated down long distances and are caught at the works, it is possible (or rather was possible formerly) to make charcoal on a large scale in huge kilns and to keep blast furnaces going. To some extent the cost of carriage can be diminished by the use of portable tramways, but it is evident that the aim must be to locate the works at a place where the largest quantity of wood can be grown on the smallest possible area.

158. Within the last ten years another attempt has been made to smelt iron on a large scale, and in this case the promoters of the undertaking took the precaution to obtain from Government the usufruct of a fine area of forest in the North Arcot District, measuring 42 square miles, the Government undertaking the management of the forest and the efficient reproduction of the areas cut over by the Company. The following account, which is taken from the records of the Government of Madras, shows that this undertaking also ended in failure.

Early in 1875, a Company styled the Napier Foundry Company was established in Madras, with the object, in addition to the ordinary foundry work hitherto carried on at the Napier Foundry purchased by them, of manufacturing castings and pig-iron from the ore by reduction with charcoal. They applied for the grant of a concession, by which they might be allowed to quarry iron ore over waste lands, the property of Government, and also be permitted to enter into and cut wood in the reserved forests of the Presidency.

159. The result of the negotiations which ensued was an agreement, concluded in November 1876, to make over to the Company the right of making charcoal in 42 square miles of forest land in North Arcot on their paying a small seigniorage, the whole area being divided into fifteen blocks, and one block at a time being opened and placed at the disposal of the Company. The block cut over was to be handed back to the Forest Department, to be closed during a few years, in order to encourage reproduction, and was afterwards to be made available to the villagers for grazing their cattle, gathering leaves for manure, for cutting fuel and wood for agricultural implements. Originally the Company applied for 24 square miles only (15,360 acres) which it was estimated would yield, if worked on a rotation of

fifteen years, from 14,000 to 15,000 tons of wood a year, estimated to make about 3,600 tons of charcoal.

160. It may be accepted as certain that, under this arrangement, the forest could not have been protected against fire, and that the areas cleared could not have been planted to any useful purpose, or otherwise improved sufficiently to make the forest yield permanently the required outturn. What should have been done was to effect a separation, to assign certain portions of the forest permanently to the villagers for fuel and other requirements, and to place the remaining area under strict protection, exclude fires and cattle, and deliver to the Company the wood required wherever the maintenance of the forest justified cuttings. Fortunately for all parties concerned, the Company, in July 1877, requested that the agreement might be cancelled, and asked permission to resign all privileges thereby conferred, which was assented to by Government. The reason assigned by the Company was that the greater part of the charcoal obtained since the Company commenced operations, being made from light and soft jungle-wood, was unsuited for use in blast furnaces. I have, however, seen it stated that there were other circumstances besides, which compelled the Company to discontinue operations.

Conclusion.

161. Under proper management, the extension of iron-smelting in the Madras Presidency will in no way increase the denudation of the country. On the contrary it will facilitate the formation, protection and improvement of the forests.

In most forests the more valuable species, the timber or other produce of which finds a ready sale even when brought from remote localities, is associated with a large proportion of the less valuable kinds, for the produce of which there is no demand in such places. The less valuable species profit equally with, and in some cases more than the valuable kinds, by efficient protection, and particularly by protection against fire. In fire-protected blocks, the forest becomes dense and thick, the grassy glades and other blank spaces fill up rapidly, but a large proportion of the material which grows up in so satisfactory a manner cannot be utilized. On the contrary its existence in the forest prevents the free reproduction of the more valuable kinds, which therefore cannot be cut as freely as would otherwise be desirable. The abundance of inferior classes of wood will therefore be felt as a burden and a source of difficulty hereafter, when a rational plan of working is set on foot. The native iron-smelters give preference to certain kinds of wood, such as *Acacia Catechu* and *Albizzia amara*, but the charcoal of most species, both of the deciduous and the evergreen forests, can be utilized for iron-smelting. I may here mention that Colonel Keatinge, when Political Agent of Nimár, before 1857, found that the light and soft wood of *Boswellia thurifera* (saler) made excellent charcoal for iron-smelting in the works established by him in Nimár and successfully worked during a series of years with the aid of a Swedish Iron Master.

162. In the vicinity of towns and densely-populated tracts the wood of all kinds produced in the protected areas will always find a ready sale as fuel or as timber; but forests must be formed for the sake of their indirect advantages also in the more remote portions of the country, and here in many cases the only plan of utilizing the abundance of the less valuable kinds will be by means of iron-smelting with charcoal. In some cases the establishment of strictly-protected reserves may have tended to extinguish the charcoal iron industry, but where this has been the case, matters have not been managed properly. When such reserves are formed, provision must always be made to supply the requirements of the iron-smelters from the areas left open, until the reserves have been brought to a high state of productiveness.

163. The extension of iron-making by means of charcoal will be a great help towards the development of rational forest management in the Madras Presidency. But the native methods of iron-smelting with charcoal are exceedingly wasteful, and an attempt should therefore be made to introduce an improved method. It is at present generally supposed that the direct system of producing wrought iron from the ore is not capable of considerable improvement. This is a point upon

which I am not competent to form any definite opinion. I know, however, that some persons in England competent to speak on the subject hold that the direct process is capable of considerable improvement, and that iron-smelting by means of charcoal in India has a great future before it.

164. Moreover it may not be impossible to carry out a suggestion made some time ago by Dr. H. Warth, Professor of Natural Sciences at the Dehra Dún Forest School, and to construct blast furnaces of a somewhat smaller size than those used in Europe, so that they can be managed by natives. The object would be to teach them the system of making pig-iron first, and converting this by a separate process into finished iron. Such experiments can only be made by Government agency, and I am of opinion that it will be well worth while to attach a competent Metallurgist, who has had practical experience in iron-smelting with charcoal, to the Madras Forest Department for a series of years, first, in order to assist the Forest Officers in the selection of reserves in the iron districts, and afterwards to undertake iron-making in suitable localities on an improved plan, with the view of gradually introducing improvements in the native methods. Efforts should at the same time be made to establish a better and less wasteful system of charcoal burning. The development and improvement of the native iron industry is as much within the scope of the legitimate duties of Government as the attempts made, by the establishment of model farms and otherwise, to improve native agriculture. The experimental operations here suggested must not be expected to yield revenue. If their cost is covered by the sale of the iron produced, that is all that can be hoped for. The object is not revenue, but to show the native iron-smelters the way towards improved and more economical methods, and to pave the way for the establishment of large iron works by private enterprize.

165. These suggestions I submit with hesitation, as a late Resolution by the Government of India in the Department of Finance and Commerce, which was published in the *Gazette of India* of the 5th August last, lays it down that the establishment of iron works to be owned and worked by the State is open to grave objections, both economic and practical. That Resolution, however, primarily refers to the Bengal iron works, which are worked with coal, and where, therefore, a private firm or company can base its calculations upon certain data regarding the quantity and cost of the fuel available; and in the second place it relates to the iron works proposed to be established in the Chanda District, where the greater part of the fuel will be furnished by the Warora coal-mines.

In the Madras Presidency, the question is much more difficult. The absence of coal and the uncertainty regarding the annual yield of charcoal per acre in the areas which may be constituted reserved forests, make it impossible at present to furnish any safe data upon the ground of which private capital might be invited to embark in this industry on a large scale. This must wait until a sufficient extent of reserved forests have actually been established, and have by continued protection and steady improvement been converted into dense forest.

CHAPTER IV.

INDIRECT INFLUENCE OF FORESTS.

166. The consideration of the indirect influence of forest conservancy upon the welfare of the people in this Presidency involves the discussion of two great questions, regarding which statements of a startling and sensational character and bold conjectures have at different times been made by many writers, but which have not yet been sufficiently worked up and determined by sober scientific research. The questions referred to are: the influence of forests upon climate, and the action of

forests in regulating surface and underground drainage. It is beyond my province to enter upon a general discussion of these questions, and it would be out of place if I attempted in this report to give a complete account of the scientific researches made in regard to them.

I must be content with submitting a series of practical suggestions which, if accepted, will, I feel assured, contribute much to the future prosperity of the country.

167. The total area of the Madras Presidency is 140,821 square miles, or 90 millions of acres. Correct details, showing the distribution of this area, have been obtained in the case of 18 out of 22 districts. For South Canara, Malabar and Nílgiri no details are entered in the statement appended to this report, and the figures which follow do not therefore relate to these districts. The Madras District and the tributary States of Sandúr, Banaganapalli and Puducottah will also, for obvious reasons, be omitted. The area of the remaining 18 districts is 128,652 square miles or 82⅓ million acres. Of this area it is estimated that 51¾ million acres are forest or waste, 31 million acres being at the disposal of Government, while 20¾ million acres are at present regarded as private property. Of the Government land 18 million acres are occupied, which may be classified as follows :—

	ACRES.
Wet	3,073,005
Dry	11,900,094
Waste, including fallows and grazing grounds ...	3,076,551
Total ...	18,049,650

The land classified as "wet" includes, besides the area irrigated from rivers, channels, and tanks, a small area, chiefly in Ganjam, which produces rice and other wet crops without irrigation. Most of the land under wells is charged at "dry" rates and is accordingly classed as dry land.

The irrigated Government land may be estimated as follows :—

Irrigated from rivers, channels, and tanks	3 million acres.
Irrigated from wells	2 ,,
Total Government land irrigated ...	5 ,,

In addition to this, a large area of Zemindari, Shrotriem and Inam lands is irrigated, the extent of which is not known. The maintenance and extension of irrigation is a matter of vital importance for the welfare of the people in this Presidency, and it is right that we should consider whether and to what extent forest conservancy can contribute towards this end. So much may be affirmed at the outset that much may be done in this direction by the protection and improvement of a portion of the uncultivated lands at the disposal of Government. And it may also be affirmed that, in South India, the indirect influence of forests is of much greater importance in this respect than in any other part of the country. At the same time it is clear that the main rivers, which are the most important source of irrigation, have their head-waters and the greater part of their catchment area beyond the limits of the Presidency, and that their water-supply cannot be affected by any measures of forest conservancy that may be undertaken by the Government of Madras. These rivers are—

	Irrigated Area. ACRES.
Godávari	530,000
Kistna	235,000
Cauvery	820,000
Total ...	1,585,000

But something can and ought to be done towards improving the water-supply in certain feeders of these large rivers and in numerous minor streams, which rise on the hills of this Presidency. And much can be done by forest conservancy to improve the water-supply in tanks, springs, and wells.

The steps which have already been taken and the further proposals which will be submitted in the present report for constituting reserved forests in the catch-

ment areas of certain rivers, which are important for irrigation, are based upon the assumption that the water-supply in these rivers will be benefited by the protection of the forests on their head-waters; but simultaneously with the action that may be taken for the formation and protection of these reserves, it will be necessary to set on foot systematic researches in order to determine to what extent we can reasonably expect that these measures will beneficially affect irrigation, and in which direction it will be most useful to extend them. As a preliminary to the following observations, it will be necessary briefly to review the climate in that portion of the Peninsula, to which the present remarks chiefly relate, with special reference to the distribution of moisture.

Climate.

168. That portion of the Peninsula, which is situated south of latitude 16°, may be divided into three regions, one dry and two moist regions.

The dry region, with an average annual rainfall of less than 30 inches, occupies the centre of the Peninsula from the Kistna and Tungabhadra rivers southwards, and comprises, besides the greater part of Mysore, the districts of Bellary, Anantapúr, Kurnool, part of Kistna, the northern taluks of Nellore, nearly the whole of Cuddapah, the greater part of Coimbatore, portions of Salem and Trichinopoly, and that portion of Madura and Tinnevelly which lies near the coast.

Enclosed in this dry region are several drier tracts with an average annual rainfall of less than 20 inches. The most extensive of these arid tracts comprises a large portion of Bellary and Anantapúr, and a long dry belt thirty to fifty miles wide, stretching through the whole length of Mysore between the Malnád on the west and the plateau of Bangalore on the east. Another arid tract comprises a large portion of Palladam, Dhárápuram, and Udamalpet Taluks in Coimbatore, and a third extends along the coast north and south of Tuticorin.

169. The western moist region comprises the country below the ghâts, the line of ghâts and mountain ranges branching from it, and a narrow belt along the eastern foot of the ghâts. This belt which has an average width of eighty miles, but is broader on the Nílgiri and Palni hills, owes its moisture chiefly, and below the ghâts, entirely, to the south-west monsoon, excepting the eastern edge, such as the Nílgiris and the Palnis, which receive a share of the north-east monsoon. This moist belt comprises South Canara, with a mean annual rainfall below the ghâts of roughly 130, Malabar with 120, and Travancore with about 110 inches. Along the line of ghâts the fall is between 150 and 200 inches, rising in places to 250 inches.

Eastwards the moisture diminishes rapidly and the eastern limit of this belt, with a rainfall of thirty inches, is generally at no great distance from the foot of the hills.

170. The third region, which may be designated as the eastern moist zone with a mean annual rainfall exceeding 30 inches, owes its moisture partly, and below the Eastern Ghâts almost entirely to the north-east monsoon. It extends along the coast from a point between Ongole and Nellore to about thirty miles south-west of Point Calimere. This eastern moist region has a most irregular shape. It includes the greater part of Nellore, the districts of South and North Arcot, the Kodúr valley of Cuddapah, part of Salem, Trichinopoly, Tanjore, and Madura, and at the last-named place joins the western moist region, so that at this point the central dry belt is interrupted. It includes the Vellikondas and other hills of the Eastern Ghâts north of the Pálár river as well as the Javádis and other ranges between the Pálár and Ponniár, besides the Kalráyans, Shevaroys and other hills south of the Ponniár river. These hills receive a large share of the south-west monsoon and have a much heavier rainfall than the surrounding plains. Thus the seasons on the Shevaroy hills are as follows:—

	INCHES.
Dry season, January to March	... 1·43
South-west monsoon, April to September ...	... 39·94
North-east monsoon, October to December ...	... 18·81
	60·18

A narrow belt, with a mean annual fall exceeding 40 inches, extends along the coast from the Pulicat Lake to Point Calimere, comprising Madras, Cuddalore, and Negapatam.

171. The limits of these three regions have been defined by the greater or less mean annual rainfall, but it must be remembered that the more or less dry climate of a district does not depend upon the mean annual rainfall only, but also upon the degree of atmospheric moisture, upon the greater or less amount of dew, and upon the prevalence or absence of dry hot winds.

For all practical purposes however, the mean annual rainfall furnishes a safe indication of the moisture, and the regions here named coincide with the character of the natural vegetation. But though we speak of a mean annual rainfall, it must be remembered that the variations in the rainfall of successive years are extremely large. Seasons of great drought and seasons of exceptionally heavy rainfall are of common occurrence in those districts of the Presidency to which the present report relates.

172. I shall not burden the present report by a detailed account of the geographical distribution of trees and shrubs in the different regions of moisture in the Peninsula. This is a most interesting and important subject, which I recommend to the earnest study of the Forest Officers of this Presidency. On the present occasion I will draw attention to a few facts only which bear upon it.

The heavy evergreen forest, the trees of which, under favorable circumstances, attain a height of 200 feet and more, is peculiar to the western moist region, where it occupies extensive areas along the ghâts and on the hill ranges, which like the Nílgiris, Anaimalais, and Palnis branch from the ghât range to the eastward. The trees which constitute this class of forest vary exceedingly. On the ghâts of the Sattara District and at Mahableshwar the character of the forest is very uniform, consisting of only about twenty to thirty species, among which *Eugenia Jambolana*, *Actinodaphne Hookeri*, *Terminalia Chebula*, and in valleys and ravines *Caryota urens* are prominent.

Further south the variety of species increases. On the Nílgiris, Colonel Beddome, in his excellent paper on the Flora of these hills, printed on page 98 of the Manual of the Nílgiri District, enumerates more than 100 trees as characteristic of the evergreen forest on the slopes and on the plateau of the Nílgiris.

The variety is still greater on the Tinnevelly ghâts, where, as pointed out by Colonel Beddome, many trees belonging to the Ceylon flora are found.

173. The evergreen forests have several important features, which it is well to bear in mind. The annual fires of the dry season do not pass through them, though where tall grass is found on the outskirts, fires gradually make inroads and thus diminish the area of the forest. The ground under the trees is stocked with dense undergrowth which is formed in places by seedlings and saplings, making slow progress under the dense shade of the parent trees, but shooting up vigorously, whenever the fall or decay of one of the old trees makes a blank; elsewhere it consists of dense masses of shade-loving shrubs, *Strobilanthes* and others. When such evergreen forest has been destroyed by cutting, fires or otherwise, a secondary growth of other species makes its appearance, among which *Sponia orientalis*, *Mallotus*, *Macaranga* and large kinds of *Solanum* are prominent. These shrubs do not require shade, and are mostly shortlived; but if left undisturbed, they afford shelter to the seedlings of the evergreen species, so that, if circumstances are favorable, the original forest has a chance of reproducing itself.

The western moist region is also the seat of the heavy deciduous forest in which teak, blackwood and *Pterocarpus Marsupium* are the most valuable trees.

174. Most of the denizens of the heavy evergreen forest, and a limited number of species which constitute the heavy deciduous forest, such as *Lagerstrœmia Reginæ*, and *Lagerstrœmia lanceolata*, which are only found in the vicinity of the ghâts, are peculiar to the western moist region. Others are also found in the eastern moist region, and some extend into the central dry region.

The evergreen forests of the eastern moist region are in most cases no more than a thorny scrub, attaining, when protected, a height of 30 to 40 feet. The following are some of the characteristic species:—*Pterospermum suberifolium*, *Mimusops indica*, *Diospyros Chloroxylon*, *Maba buxifolia*, *Hugonia Mystax*, *Plectronia parvi-*

flora, Strychnos Nux-vomica, Strychnos potatorum, Sapindus emarginatus, Memecylon, Erythroxylon monogynum. Above an elevation of 3,000 feet, on the Javádis, Shevaroys and other hill ranges of the Peninsula, where the climate is cooler and moister than on the lower hills and in the plains, there are stretches of heavier evergreen forest, containing some of the species which are found in the evergreen forest of the western moist region.

175. The most important trees which are characteristic of the central dry region are the red sanders (*Pterocarpus santalinus*) and the sandalwood (*Santalum album*). Both species, however, extend beyond the limits of this region, for the red sanders is found on the Vellikondas and on the Kambákam hill of Chingleput, and the white sandal extends westward into the belt where the rainfall exceeds 30 inches, though it keeps at some distance from the line of ghâts.

176. *Albizzia amara* and *Premna tomentosa*, two trees of great importance for the fuel-supply of the Madras Railway, are common in the drier jungles of the central region, but they also extend to the eastern moist belt. The same may be said of *Acacia Latronum*, a characteristic tree of the dry region, extending from the hills of the Poona District southwards to Tinnevelly, but also found in the jungles of the Nellore District between the Vellikondas and the coast. *Gymnosporia montana*, a shrub common all over the dry hills of Central India and the Dekkan, also occurs below the Eastern Ghâts, but I only met with it in the Nellore and Chingleput Districts and did not find it in the jungles of South Arcot.

Acacia planifrons, the umbrella thorn, is peculiar to the southern portion of the central dry region, where it forms extensive jungles on the coast north of Tuticorin, associated with *Acacia Latronum*, *Lawsonia inermis* and *Gmelina asiatica*. It is found all over the drier parts of Tinnevelly, Madura, and Coimbatore, but does not, as far as I know, extend north of the Nóyil river in the last-named district. Cultivated, it thrives at Anantapúr and Bellary.

These remarks must suffice to indicate the points to which Forest Officers should direct their attention in studying the geographical distribution of the trees and shrubs of Southern India, and the connection between the natural limits of each species and the climate.

The climate cannot be materially altered by Forest protection.

177. No data have been established which would justify the hope that by the creation of new forests or the improvement of those existing we shall be able to modify the limits of the regions of moisture, or otherwise materially to alter the climate of any district in the Peninsula. The great features of climate depend upon cosmic causes which are independent of local circumstances.

It has been established by continued experiments made by L. Fautrat in the forests of Halatte and Ermenonville in France that a guage placed above the crowns of the trees in a forest, collects more rain than another placed in its vicinity at the same height from the ground but outside the forest. A brief abstract of these observations will be found recorded in paragraph 56 of my Report on Ajmere and Merwara, page 17. Observations of this kind will, it is hoped, some day be made in the Indian Forests. Large extents of forest or large areas of irrigated land may have some effect in increasing the rainfall at certain seasons, and there is no doubt that in the vicinity of dense forests, and on irrigated lands, the air near the ground is generally moister during the dry season and the dew heavier. Nor is there any doubt that forests, if well stocked, afford effective shelter against scorching winds, and that in the hot weather the shade and shelter afforded by trees is a great boon, and is beneficial alike to crops, to man and to cattle.

178. These are, however, advantages which, though exceedingly important, only affect the immediate vicinity of the forest. The idea that forest conservancy can in any way materially alter the climate of the Peninsula, or can guard against the recurrence of seasons of excessive drought must, I fear, be put aside, and our plans regarding forest administration in the Peninsula must, at present at least, be framed without reference to such expectations.

Effect of Forests in protecting the Soil, and regulating Surface and Subsoil Drainage.

179. It is different in regard to the influence of forests in other respects. They protect the soil on slopes and hills, and there is good ground for believing that they regulate the distribution of the rain-water which falls upon the ground and the surface and underground drainage. In this respect the action of forests is, we believe, most beneficial in a tropical climate. The action is this: *First*, the foliage breaks the force of the rain which therefore falls upon the ground more gradually and gently; *Second*, the loss by evaporation is less; *Third*, decayed leaves, moss, twigs and other matter on the ground in the forest act as a sponge and prevent the rapid down-flow of the water; *Fourth*, the soil which is permeated by the roots and is mixed with vegetable mould, is loose and facilitates the percolation of the water, which comes out at a lower elevation in the shape of springs.

A further and most important result is, that less soil is washed away from the hill-sides and that less sand and silt are carried down by the rivers. Regarding this point, no doubt is possible. Wherever clearances are made on the hills in those districts of India which have a heavy rainfall, the loose soil is washed down into the streams and rivers, unless retained by terraces, lines of trees, shrubs, or other vegetation. There is not a district in the moister regions of India where the evil effects of denudation in this respect are not visible. The sand which is washed down from the denuded hills in the Hoshiárpur District of the Punjab, has destroyed the fertility of large areas. Ravines and torrents are numerous in the more thickly inhabited portions of the North-West Himalaya and in the Darjeeling District in Bengal. And yet in these districts the climate is so favorable, and vegetation so luxuriant, that hill-sides, which have been cut up by landslips and torrents, if left alone, often reclothe themselves rapidly with grass, herbs, and other vegetation. Even on the Nílgiris the evil will be felt sooner or later, although these hills are favored beyond any hill range in India by gentle slopes, deep soil, and a moderate rainfall, which is distributed over nine months of the year, and most of which comes down in gentle showers. Every year masses of fine silt, which, if retained, might be a source of wealth to the planter, as well as to the Badaga, are washed down into the Bhaváni and Moyár rivers, and unless the slopes are terraced, or coffee, tea, and chinchona are planted close in horizontal contour lines, the annual loss of rich loose soil will eventually make itself felt.

The Ratnagiri District, in Bombay, is almost bare up to the crest of the ghâts. Here the effects of denudation have shown themselves in this way:—There are four principal streams in the district, which, rising in the ghât mountains, run a short course to the sea, all of which were formerly navigable and important for the trade of the country. For small boats they are still navigable, but they are gradually silting up, because the hills on their head-waters have become denuded of forest.

180. As regards evaporation, it may be useful to draw attention to the results of the experiments made at six stations in Bavaria, in the forest and in its immediate vicinity outside, which are recorded in the work by E. Ebermayer, entitled "Die physikalischen Einwirkungen des Waldes auf Luft und Boden, 1873." On page 159 the author states, as the result of these experiments, that the quantity evaporated in one year (1868-69) from a free surface of water, measuring one square foot (Paris), was as follows:—

In the open	3,180 cubic inches (Paris)	corresponding to a stratum of water	598 millimeters deep.
In the forest	1,164 „ „		219 „ „

Ebermayer also states that the mean annual evaporation in the open, at different places, had been found to be as follows:—

	MILLIMETERS.		MILLIMETERS.
Vienna	729	Paris	783
Lausaune	756	London	780
Bar le Duc	531	Liverpool	962
Auxerre	557	Manchester	780

The great difference in the results, Ebermayer ascribes to the different construction of the instruments used and to the different modes of placing them. In London it was found by Halley that, while in a room 208 millimeters evaporated

during the year, the evaporation amounted to 1,248 millimeters if the surface of the water was freely exposed to sun and wind. In dry districts of India evaporation is naturally much more rapid than in northern Europe. Thus at Nagpore, the quantity evaporated from the Ambajhari tank during the dry season (8 months) was 7 feet, equal to 2,135 millimeters; and Mr. Culcheth came to a similar result in regard to evaporation from tanks in Ajmere and Merwara. It may be assumed that in India the effect of forest in diminishing evaporation is much greater than in northern Europe.

The effect of forest upon the moisture in the soil is however of a most complicated nature. For while on the one hand the evaporation of the rain water is diminished, there is on the other no doubt that, under certain circumstances, trees and forests tend to dry up the soil, the roots drawing up moisture often from great depths, which is evaporated by the leaves. It is a common practice in Europe, to dry up swamps and wet places by planting fast-growing trees. Mr. D. E. Hutchins, Deputy Conservator of Forests, Mysore, informs me that the effect of plantations of Casuarina and other trees, so successfully made at Bangalore and elsewhere on the Mysore plateau, has been, in some cases, to diminish the water-supply in wells in these plantations and in the station of Bangalore. His views on this subject will be found set forth in a paper regarding the influence of forests on moisture, appended to this report. (Appendix VI.)

It will now be well to examine the probable effect of forests upon the water-supply in tanks, streams, springs and wells.

181. Speaking broadly, the result as regards the supply of springs, streams and rivers is believed to be this, that springs are better supplied and that streams and rivers are less subject to sudden floods and have a more even and longer continued flow of water if their catchment area is stocked with forest than if it is bare. The effect is the same upon tanks which are fed from springs and streams. But upon tanks with a small catchment area, which are fed only by the surface drainage coming direct from that area, the effect is different. Tanks of that description would store the largest proportion possible of the water coming from the catchment area if that area were smoothed and plastered over, and made impermeable to the rain which falls upon it. In such cases a hard-baked surface of the catchment area, without any vegetation, would be most effective.

Proportion of Rainfall stored in Tanks.

182. To this kind of tanks belongs the well-known Ambajhari tank near Nagpore, with a catchment area of 4,224 acres, rocky, unculturable, and almost treeless, the rough grass on it partly burnt off annually, partly cut for thatching, and partly grazed off. The history of this tank, which is recorded in Volume XXXIX of the Proceedings of the Institution of Civil Engineers, page 1, presents the problem in its simplest form. Here at the end of the hot season, the heavy showers of June 1872 produced no flow into the tank, as all the water was absorbed by the dry and parched soil; whereas in September when the ground had become saturated, of a heavy shower of 2·2 inches which fell in one hour and twenty minutes, 98 per cent. entered the reservoir within two hours and fifty minutes. The discharge of this drainage area varies with the intensity of the monsoon, the proportion of water flowing from the drainage area being 21 per cent. in light monsoons with a fall of 24 inches, and 40 per cent. in heavy monsoons with a fall of 44 inches. The mean annual rainfall of Nagpore is 40·7 inches, of which 3·2 inches fall in the dry season. But of the showers which fall in the dry season no appreciable quantity flows from the ground into the tank. The quantity evaporated from the surface of the tank during the dry season (8 months), from October to June, was found to be a depth of 7 feet, or at the average rate of 0·0289 foot (one-third of an inch) a day.

183. Tanks of this kind, which are fed by direct surface drainage only, will naturally not benefit if the catchment area becomes clothed with forest. Thus several instances have been observed by Mr. Wooldridge in the Gingee and other reserves of South Arcot, where shallow tanks have ceased to be filled since the forest on their catchment area has become dense and heavy. In these cases the rain which formerly ran off the ground and filled the tank now soaks into the ground and

probably feeds springs which appear at a lower level and at a distance from the forest.

Mr. E. E. Fernandez, Superintendent of Working Plans, has communicated to me an account of a tank in the Nimár District of the Central Provinces, as follows :—

"In Block III of the Punasa reserve is situated the Bhorla tank, which covers, when full, about 24 acres. In 1874 and 1875 the forest on the catchment area of this tank was not protected from fire. Protection began in 1876, and was successfully continued up to May 1880. Before protection, the tank filled up soon after the first few heavy falls of rain ; after protection was commenced the water reached the top of the weir, thrown across the feeding nala to form the tank, only in August-September, and in 1880, when the rainfall was an unusually short one, not at all. The dry standing and lying grass and layer of dead leaves, &c., impeded very considerably the surface drainage. Besides this the difference in the amount of silt washed into the tank was very remarkable. Up to 1876 the water remained muddy until January. After that year I could get clear drinking-water from the tank in November ; and even during the rains the water was comparatively clear and fairly drinkable. Outside the forest, near the village of Punasa, is situated another tank, which invariably fills up from a fortnight to a month or more earlier, although a portion of its catchment area lies inside the fire-protected forest. It is scarcely necessary to add that more water passed over the masonry weir below the Bhorla tank before fire protection than since."

Other instances are described in the following note, communicated to me by Mr. Hutchins :—

"I can recall two instances in Mysore where this action has been very marked, one in each of the two oldest established of the central hill forests. The Devaraiyadrug and Nandidrûg forests have each been reserved and fire-protected for many years. The bare stony hill-sides have become clothed with forest growth and a vegetable soil, which arrests the flow of rain water. The rainfall, 35 inches, is, in that climate, not sufficient to form springs, the subjacent formation is massive gneiss : it may be assumed that the greater portion of the rainfall is retained on the spot and returned to the atmosphere as the watery exhalation of foliage, this exhalation being greatest during the early part of the dry season.

"In the centre of the Devaraiyadrug forest is the Kumbarhalli tank fed entirely by water running off a circle of hills, all lying within the forest boundaries. As these hills became clothed with forest it was noticed that the water in the Kumbarhalli tank began to decrease. In 1874 it was still a large sheet of water. I have a personal recollection of having shot ducks on it in that year.

"I saw the tank in 1877 quite dry : this was a year of partial drought. 1878 was a year of abundant rain. In that year or 1879, a year of very heavy rain, I remember shooting snipe near this tank and talking with the Forester about the small supply of water : there was nothing more than a swamp and a puddle at one end, which could be walked through. The Forester, an old and intelligent official whom I have known for years, attributed the absence of water to fire-protection, saying that the old dead grass on the hills kept the water from running into the tank. The bed of the tank is now being planted with Casuarina and sandal.

"Another instance is a tank near the village of Hegadarhalli lying outside the Nandidrûg forest, but fed from a hill stream coming from the forest : this tank is now usually empty or with little water in it, the rush of water from the hills being stopped by the growth of forest."

184. Important researches have been made regarding the water-supply to the tanks of the Ramsagar series in Mysore, in the catchment basin of the Pálár river, which have an aggregate drainage area of 804 square miles and a waterspread at weir-level of 62 square miles or 39,680 acres. The mean annual rainfall is 30 inches, and of this about one-fifth is stored on the average.

Of exceptionally heavy rainfalls a larger proportion reaches the tanks. Thus on the 1st September 1879 all tanks were empty and the total fall to the end of November was 26·73 inches, of which 45 per cent. reached the tanks. These tanks are fed both from springs and streams and by direct surface drainage, and it is probable that if the catchment areas could be placed under protection and stocked with forest, they would fill more gradually and the water-supply in them would last longer into the dry season.

185. The tanks in Ajmere and Merwara, the observations regarding which are recorded on pages 21 to 23 and 48 of my report of 1879 on Forest Administration in Ajmere and Merwara, are partly fed by direct surface drainage, and partly from springs and small streams. There is a long dry season from October until May with slight falls aggregating about two inches, and a short rainy season from June to September with a rainfall of 21 inches. The water-supply of five large tanks, including the Anasagar tank near Ajmere, was carefully studied between 1871 and

1876 by Mr. W. Culcheth, at that time Executive Engineer, Irrigation Division, Ajmere, and the result was that these tanks only fill after heavy falls of rain, and are not affected to any considerable extent by light showers. The proportion of the water collected in these tanks during the periods over which the observations extended was between 10 and 28 per cent. of the total rain that fell upon the catchment area, the mean being 18 per cent.

The following extract from the report quoted contains my conclusions on this subject:—

"70. The rain which falls upon the catchment area divides itself into three unequal portions.

"The largest portion evaporates, while smaller quantities flow off on the surface, and a third portion sinks into the subsoil, reappearing at a lower level in springs and streams. In a well-stocked forest, a fourth portion must be considered, viz., the water which is retained by the branches and foliage. This portion, however, may, in the case of the hills of these districts (Ajmere and Merwara), be left out of consideration. As far as the tanks are concerned, they only benefit by the surface flow and by the yield of springs and streams. The water which evaporates is lost to them. Now, it must be remembered that the air is, as a rule, exceedingly dry in these districts, even during the monsoon; further, that the bare ground on these hills at that time of the year is exceedingly hot and dry. When rain falls upon this heated surface, a considerable quantity of the water is evaporated at once, and a further large quantity is absorbed by the surface soil, most of which is eventually lost by evaporation during the intervals of heat between the showers. In this manner all the benefit of light showers is lost. A heavy downpour, on the other hand, at once saturates the surface soil with water, and after this has been accomplished, the surface flow increases and the tanks are filled.

"71. Now the effect of clothing the catchment area of these tanks with trees, grass, and brushwood will certainly be to diminish evaporation, and thus to increase the amount available for the tanks. We may conclude from Mr. Culcheth's experiments that the quantity now lost by evaporation amounts to five-sixths on an average of the rain-water which falls upon the catchment area, but with diminished evaporation the flow into the tanks from a wooded area will be much greater than from a bare surface. To recapitulate, it may reasonably be expected that the protection of the catchment areas will tend to increase the supply of water in tanks by diminishing the loss that now takes place by evaporation from the catchment area itself, when the water soaks in a few inches only, except after very heavy rain, and is then evaporated as soon as the sun comes out. This is repeated many times during the season, and but little water comparatively comes into the tanks, except after heavy rain, when there is a great rush, which is continuous enough to do more than to saturate the surface soil.

"72. But the clothing of the catchment area will have another advantage. At present the tanks are generally only filled once or twice during the rainy season, and on these occasions some of the water is often lost by overflow. The increase of forest growth will certainly have the effect of retarding the surface flow, the tanks will be filled more gradually, and the flow will continue for some time after the rains have ceased The account given by Mr. Culcheth of the continued flow into the Bir tank and the continued rise of its level for 35 days after a heavy fall of rain in September 1875, shows that under certain circumstances the flow of water into the tanks continues for a considerable time after the rain has ceased. In the case of the Bir tank the long continued flow is chiefly attributed to the character of the soil, but increased forest growth will doubtless have a similar effect; it will tend to prolong the flow of water into the tanks and will thus assist in utilizing it more completely.

"73. Lastly, the quantity of silt brought down by heavy falls of rain will be diminished by better forest growth on these hills. One of the most striking features in Merwara is the large number of the smaller tanks which have completely silted up, often to the edge of the embankment. Many of these silted-up tanks have now been converted into fertile fields, the rich silt forming excellent soil, but it was hardly intended, when building embankments, some of which have cost several thousand rupees, to form a few acres of fertile fields. Indeed, it may be said that of the numerous tanks constructed by Colonel Dixon, the great ruler and benefactor of Ajmere and Merwara, many have now become useless, either through silting up, or because their bunds were breached, and the ultimate cause of this has been the denudation of the hills which form the catchment area of these tanks.

"In the case of the larger tanks, the process of silting up is reported to progress very slowly, but whatever the rate of progress of the silting up may be, every ton of silt deposited in these tanks is an unmixed evil, which should, as much as possible, be guarded against. Even if the whole catchment areas of these tanks were perfectly stocked with forest, the floods caused by the heavy rains would always bring down a certain quantity of silt, but this quantity is much larger when the catchment area is bare and naked."

Portions of the catchment area of several of these tanks have been placed under protection, and it is my opinion that if this protection is sufficiently extended and effectually maintained, the water-supply of these tanks will be greatly improved. At the same time I admit that this is a point which must be established by actual

experience. What has been established by actual experience is, that less silt and sand are carried into the tanks when their catchment area is clothed with forest, than when it is bare.

Water-supply to Springs and Wells.

186. The beneficial effect of forest growth upon the supply of water in springs is more general than in the case of tanks; for springs are the result, not of surface drainage, but of the water which percolates into the ground and reappears at a lower level. The instances in which springs have disappeared after the area which furnished their water-supply had become denuded are numerous, both in this Presidency and in other parts of India. The following instances are quoted by Surgeon-General Edward Balfour in his paper on the influence exercised by trees (1878):—

Surgeon C. I. Smith, of the Mysore Commission, writing in 1849, "records the belief of the people of Coorg and of the Superintendents of the Nuggur and Chittledroog divisions of Mysore, that the presence of trees in a country tends to increase the quantity of rain. He furnished three instances of the destruction of springs by denuding the ground of trees. One of these was in a range of hills south-east of Bangalore, at a coffee plantation called Glenmore, in the Debenaicottah taluk of the Salem district. The proprietor, when preparing ground for a coffee garden, which was watered by an excellent spring, was warned by the natives not to clear away the trees in the immediate neighbourhood of his spring, but he disregarded their warning, cut down the trees, and lost his stream of water. Another instance was at the village of Hoolhully, about eight miles distant from the head of the new ghaut at Munzerabad. A planter had a nursery there, which he watered by turning on it a watercourse from a spring. He cleared up, for planting, the sides of the ravine in which the spring was, and ceased to have anything like the quantity of water he had before the shade was cleared. The same planter, close to the bungalow where there was a spring, had some years before cleared a ravine for planting, and found the water decrease in like manner; but, the coffee trees dying away, and the place being too small for a plantation, he did not renew them, and allowed the jungle to grow up again, since which the stream had nearly regained its former size."

Analogous to springs is the case of wells, and here I desire specially to draw attention to those cases which are numerous in this Presidency as well as in other parts of India, in which wells are dug at the bottom of a valley, or near the bed of a stream. These wells tap the underground water-stratum, and we believe that the water-supply in such wells will be greatly improved, and will be maintained longer during the dry season if forest growth is permitted to spring up on the hills which surround them. It is an acknowledged fact, which has also been observed during the late famine in South India, that during long continued drought, wells hold water much longer than tanks. This is not surprising, considering the rapid evaporation by which the surface of tanks is steadily lowered during the dry season. During seasons of exceptional drought evaporation is naturally much accelerated. On my tour I was much gratified to see in Bellary, Salem, and other districts, the large number of new wells made since the famine, and old wells deepened; and it seemed to me that the people fully recognize the value of wells for irrigation. Many of the wells in the dry inland districts are large and beautifully built, 30 feet square, and 25 feet deep or more. Such wells often cost from Rs. 500 to Rs. 1,000. Under these circumstances it is most important to determine by experiments, systematically made, to what extent the water-supply in wells is benefited by clothing with forest growth the hills which surround them. Of Government land only, no less than two million acres are irrigated from wells.

187. In 1879 I urged that in the reserves of Ajmere and Merwara the water-level in wells be measured during the hot season, in order to ascertain the effect of forest conservancy upon the water-level. It may be useful to officers in this Presidency to give an extract from the report which contained those suggestions:—

"There seems good ground to expect that the irrigated crops will benefit largely if the areas from which they derive their water-supply are placed under protection. This beneficial effect will, I expect, chiefly manifest itself in the hilly parts of the district, and in the case of land irrigated from wells and moistened by dams. The fields thus watered frequently occupy the bottom of valleys and stretches of low ground among the hills, and if in such cases the hills which enclose these valleys are protected and permitted to clothe themselves with forest, the result will probably be that a less proportion of the rain which falls upon the catchment area will be lost by evaporation, that the surface drainage will be retarded, and that the water,

instead of running off rapidly, will serve to keep the loose soil which fills the bottom of the valleys moist during a longer period than would be the case if the hills forming the catchment area were denuded. Most of the wells are near the beds of streams, which, though without running water on the surface, have at a varying depth below the surface a stratum of water-holding soil which feeds the wells during the dry season. It is probable that this underground stratum will retain water longer during the dry season, if the catchment area is protected than if it is denuded.

"This, however, is as yet only an assumption which should be proved by direct experiments. These experiments will consist in measuring the level and depth of water in wells. The wells selected for these observations should each have its distinguishing number. Some should be situated in valleys, the heads and sides of which are protected, and others in valleys which derive their water-supply from hills not under protection. At the mouth of each well a horizontal slab should be selected or be placed in position, and on it should be roughly engraved the number by which the well is designated in the record of these experiments. The depths to be recorded should be measured from this slab in the following manner :—

"A rod 6 feet long should be laid horizontally on the slab in such a position that 4 feet will extend beyond a point marked on the edge of the slab ; a line should be cut on this stone, and the rod should always be laid along this line. At the end of the rod should be an eye, and through this eye will be passed a line with plummet attached, which will be lowered to the bottom of the well, and the depth below the eye to the surface of the water and the bottom of the well will be recorded.

"In each valley a number of wells should be selected, but it is not intended to take any wells, the ordinary water-level of which is more than 15 feet from the surface. Deep wells on high ground should not be selected. It will suffice to make the observations at each well once a week during the months of March, April, and May, and these observations should, if possible, be continued until the rains have fairly commenced. The water-level in wells which are in use for irrigation naturally fluctuates considerably, but during the months named wells are not much used except for sugarcane and cotton, and therefore it will probably be possible to select wells for these experiments which are not used at all during the months in which the observations are made.

"Should any well selected be in use, care should be taken so to arrange the time of the observations that the level of the water may be as near its normal state as possible, say early in the morning, or after the well has had several days' rest. It may also happen that the level of water in a well is affected by a well situated above it in the same valley. Such circumstances which may affect the water-level in the wells should be carefully noted and entered in the book which will be kept for the record of these observations.

"Some of the wells selected may be found to dry up during the dry weather ; but, as far as possible, wells should be selected which are known to retain water throughout the year. In order to make these observations in a complete and satisfactory manner, it will probably be necessary to dig some wells for the purpose. The diameter of the ordinary wells found in these valleys varies from 8 to 15 feet, but wells dug for the purpose of these observations probably need not be more than 6 feet wide. Isolated wells should be avoided, for it is essential that observations should extend to continuous lines of wells situated in the same valley. This is obviously necessary in order to obtain data for the study of the question how far the water-supply is affected by protecting and improving the forest growth on the hills around the valley in which the well is situated. It will probably be found that some of the wells which will thus be selected are fed by springs, and that others derive their water-supply from what may be termed an underground current, or, perhaps more correctly, a water-holding stratum which may be supposed to exist below the bottom of the valleys, appearing here and there at the surface as a trickling stream which runs for some distance, until it again disappears to continue its underground flow. It may be regarded as certain that the water-supply in wells thus situated will be increased by the protection of the forest. The first effect which will probably be observed will be, that as protection progresses and the forest grows thicker, wells which formerly became dry during the hot season will retain water throughout the year."

Water-supply to Streams and Rivers.

188. The effect of forests upon the water-supply in streams and rivers presents more complex questions than in the case of tanks, springs and wells. Streams and rivers are filled both by surface and underground drainage, and though it is highly probable that the forests on the catchment area act in the same way as a reservoir would act, by retarding the downflow of the water, and thus making it available for a longer time after the rains have ceased, there is as yet no definite proof of this being the case. The effect of a fringe of trees along streams in diminishing evaporation is obvious and undoubted, and it is most desirable that belts of trees on the banks of streams should be protected wherever practicable. The present question, however, is wider and more important ; it is to

what extent the water-supply in rivers during the dry season is improved by forest growing on the catchment area.

The Támbraparni river in Tinnevelly, which probably irrigates a larger area in proportion to the extent of its drainage basin than any other river in the Peninsula, has its head-waters protected by a large extent of dense evergreen forest, while the Vaigai river, which passes the town of Madura, is most uncertain in its water-supply, and is therefore, except in its upper part, of very little use for irrigation. This river has a larger catchment area in the hills than the Támbraparni, but a considerable portion of it is bare and without forest. At first sight the remarkable contrast between these two rivers seems to prove the beneficial influence of the almost continuous forest belt at the head of the Támbraparni, but there are other circumstances besides the difference in forest growth, and the chief of these is, that the rainfall on the upper part of the Támbraparni catchment area is much larger and more continuous throughout the year than on the hills in which the Vaigai takes its rise.

189. In the Coimbatore District the Nóyil river, the main branch of which rises in the Bolampatti valley, probably has less water in the dry season now than it had thirty years ago. In the upper part of the river the channels still yield sufficient for irrigation, and the large tanks near Coimbatore are most beneficial in storing the flood-waters. In the Coimbatore taluk large extents of paddy-fields and a long belt of palm groves, of cocoanut and areca palms, are watered from this small river, but lower down, in the Palladam taluk, irrigation has much diminished, and there are old anicuts and channels in that part of the district which are now unused, owing to want of water, but for which a supply of water must have been available at the time when they were constructed. It is probable that the diminution of the water-supply in this river is chiefly due to the reckless destruction of the forests at the head of the Bolampatti valley, which has steadily progressed during the last thirty years, and it is likely that, if this destruction is not checked, the palm gardens, which are the ornament and source of wealth of the valley above Coimbatore, will gradually dry up. But these also are conjectures which have not yet been conclusively proved.

190. Again it may be regarded as probable that the very large and steady water-supply of the Bhaváni river is to some extent due to the large forests which clothe its catchment area, and that of its main feeder, the Moyár, on the Nílgiris and in the Attapádi valley, though to a great extent it is doubtless due also to the numerous swamps on the Nílgiri plateau, which act as natural reservoirs. But it has not yet been proved by actual experiment that the denudation of this area would impair the water-supply in this river.

191. The Pálár river rises in the Kolár District of Mysore; the whole water-supply derived from the catchment area in that district is stored in the tanks of the Ramsagar series in Mysore, and only during exceptional floods does the surplus water find its way into North Arcot. But the river has numerous feeders in the North Arcot District, and it is believed that its present unsatisfactory water-supply is due to a great extent to the wholesale destruction of forest and jungle for railway fuel in the Kangundi Zemindari.

192. In 1873 Mr. H. G. Turner, when Special Assistant Agent in Vizagapatam, drew attention to the fact that during the dry season the Godávari river derives its chief supply of water from the Indrávati and Severi, although these rivers have a much smaller catchment area than the main river, and the numerous tributaries which join the Godávari above the mouth of the Indrávati river. This remarkable fact Mr. Turner ascribed, probably with justice, to the circumstance that the hills which are drained by these feeders are better wooded than those in the Dekkan, whence the main river and its chief feeders take their rise.

The following is an extract from Mr. Turner's report:—

"We are, therefore, brought to the conclusion that the hot-weather waters of the Godavery owe their existence, in a very great measure, to the wooded upland that intervenes between the high Eastern Ghâts and the bed of the Godavery.

"This plateau is, as I have mentioned above, 100 miles long by 40 miles broad. The numerous streams, which combined, contribute to the Severi and the Indrawati that strength

that enables them to roll in the latter instance 250 miles and in the former 200 miles to the Godavery, rise among the hills that dot this 3,000 feet plateau. These rivers flow in the case of the Severi 60 miles, and in the case of the principal feeders of the Indrawati 40 miles through this hilly upland; and, at every turn, drains, ditches, brooks, rivulets, and larger tributaries contribute something towards keeping them alive during the hot weather. It is difficult, on looking at the mighty roll of a river like the Godavery, to carry the mind back to the contemplation of a trickle of water oozing out of a bog situated at the base of jungle covered hill-side several hundred miles away. Yet, if the statements that I have set forth above be admitted to be correct, that far-off swamp demands also attention in its degree. It owes its existence to the vegetation above it. Every bush is to it as a reservoir. A gap caused by the fall of a tree is as hurtful to its prospects of life during the hot weather as a breach in a tank-bund is to the rice-field beneath it. It is even more so. The tree not only feeds it with water, but by its shade keeps the water it gives from evaporation.

"Throughout the whole length and breadth of these uplands, where lie the swamps which thus require protection, denudation of the hill-sides is going on to an alarming extent. I can myself call to mind a score of hills that have been completely cleared of forest within five years. I have hunted bison in the rough jungles that have now no vestige of existence. Old men point to country where there is now not a copse large enough to hide a sambur for hundreds of square miles, and tell me that, in their youth, that land was covered with jungle."

The cases which have here been quoted, seem to show that the forest exercises a considerable influence on the water-supply of rivers. We do not maintain that forest protection will regulate the water-supply in rivers to such an extent as to obviate the necessity of constructing large reservoirs for storing the flood-waters; what we maintain is, that the protection of forests on the hills of South India will increase the usefulness of such and other works undertaken to improve the irrigation from these rivers.

It has not, however, yet been demonstrated by precise figures, that the water-supply in the rivers of Southern India has actually been improved by the forest on their catchment area.

Forests useful in regulating Floods.

193. If forests have a beneficial effect in regulating the water-supply in rivers, they must necessarily diminish excessive floods; and if the action of forests in this respect were proved beyond all doubt, it would be well worth while to encourage the growth of forests on the catchment areas of rivers in Southern India, merely with the object of guarding against excessive floods. It must, however, be borne in mind that open and imperfectly-stocked jungle, where grass and leaves are consumed annually by jungle fires, has none or hardly any effect in protecting the soil, in regulating the water-supply, and in diminishing floods. When I speak of the possible beneficial effect of forest, I mean dense forest, which is safe from fire and the ground under which is covered with the remains of grass, twigs, and leaves. Such growth is found naturally only in dense evergreen forest, elsewhere it must be created by continued protection and chiefly by protection against fire.

The beneficial effect of forest thus protected and improved was very marked in the following case:—

In 1878, a road was built from Ellichpur in Berar into the heart of the Melghát forests, which had been protected against fire for ten years, and had consequently become in most parts thick growth, with a heavy layer of old leaves and grass on the ground. The road leads partly through the forest thus protected, and partly through the open or unreserved forests, where no protection had been attempted; and the Executive Engineer who constructed the road wrote as follows regarding the effect of protection upon floods in that part of the country:—

"During the late heavy rain, viz., 4 inches in 24 hours in the beginning of June 1879, I had four bridges in construction in the Bairagarh reserve on the Ellichpur-Pili road, viz., Nos. 18, 19, 22 and 23. The foundations of these bridges were not finished, and I expected much damage to them by the early rains. Much to my surprise I found that when the rain was finished none of the nalas over which these bridges are being constructed had been in flood, and no damage had been done to the foundations. In the unreserved forests, between Sirasban and Ellichpur, all the nalas had been in flood, and I attribute the escape of the foundations of the bridges in the reserve to the rain having been absorbed by the old fallen leaves and grass, thus showing the protective power of forests to bridges in preventing sudden heavy floods."

Mr. E. E. Fernandez, who has had considerable experience in the fire-protected forests of the Central Provinces, writes:—

"Everywhere where I have been during the rains, in forests protected from fire (and this occurred every year from 1874 to 1880), I have always found that it required not only heavy but continuous rain at the beginning of the monsoon (before the ground was saturated) to cause the nalas and dry streams to run, and that during the heaviest falls of rain there was never anything like a rush of water over the surface, such as is commonly seen in open land, or in forests in which the grass has all been burnt."

194. In Coorg, Colonel Sankey, when Assistant to the Chief Engineer of Mysore and Coorg, reported that owing to the denudation of the forests the bridges and culverts on several roads had been destroyed by the floods and that numerous slips had occurred on the ghât roads. He wrote:—

"In the former condition of the country, when dense rolling forest covered all but the mountain-tops and the rice-lands in the deep intervening valleys, the rainfall was in part sucked up by the redundant vegetation; in part absorbed into the earth, being stopped from flowing off by thickly-interlacing roots; in part evaporated from countless leaves and stems, and only probably a comparatively small portion enabled to flow off at once into the various streams.

"It appears to me however, that in consequence of the great areas of forest land now laid bare yearly by the planter, the rainfall is discharged much more rapidly down the mountain-slopes than was formerly the case, among other results, giving rise to floods of yearly increasing magnitude."

In several districts of this Presidency, through which I have marched I have passed numerous bridges destroyed by floods, and it is possible that some of these floods might have been prevented if the forests at the head-waters of the streams had been better protected. Indeed, it has been maintained that there are more broken bridges in the Madras Presidency than in other parts of India. This however, even assuming it were correct, may equally well be explained by the fact that more roads and more bridges have been built in this Presidency than elsewhere, and cannot be held to prove that high floods have been the result of denudation.

195. Neither the effect of denudation upon the water-supply in rivers, nor its effect in moderating floods, has yet been proved by precise experiment in India. As regards Europe, the matter stands thus, that both questions are still considered to require further investigation. Numerous researches have been made to determine the influence of forest in regulating floods and preventing inundations, and the result of these researches has as yet been neither uniform nor conclusive.

Opinions adverse to the influence of Forests on Floods and Water-supply.

196. In India the testimony of experienced officers is as often against the assumption that forests exercise a beneficial influence, as in favor of it.

In regard to the report by Mr. Turner on the feeders of the Godávari, which rise in Jeypore, the Board of Revenue in their Proceedings of the 29th August 1873, distinctly state, "they (the Board) more than doubt whether forests are of importance as attracting rain, or protecting the sources of rivers;" and in 1878, Sir William Robinson, then Member of the Government of this Presidency, stated his views on this subject as follows:—

"The advancement of population and cultivation has led to the substitution of agriculture for scrub and jungle through great tracts in South India of late years, without any evidence of injurious effects on the south-west or north-east trades which supply South India with its moisture. The stratifications of the earth's surface which fill the country's springs—deep-seated enough to be uninfluenced by surface verdure—and supply its streams, have not changed; and cultivated land has doubtless proved here, as elsewhere, a better absorbent of moisture than scrub and jungle-clad waste. Forests have not been arresting famines in India, nor has their denudation been affecting the solar heat in general in recent years. Human health has improved where formerly malarious fevers searched the pioneers of cultivation under jungle influences; and the haunts of wild beasts have receded. I think therefore that this fashionable scare need not trouble the Famine Commission in relation to the failure of the monsoons and natural droughts arising therefrom."

197. And at the present time I have heard the opinion stated repeatedly in this Presidency, that forests have no effect upon the water-supply, or floods in rivers; that in the dry season no streams ever rise in forests, but only in swamps and other

natural storing grounds; that forests instead of increasing the water-supply have the effect of drying up the ground and of evaporating the water which, if there were no forests, would find its way into the rivers. Mr. H. G. Turner himself, I believe, has by further experience been induced to modify the views which he expressed in 1873.

These views, held by experienced officers, are entitled to respect, and as long as such views are held, and as long as the beneficial effect of forest in regulating the surface and underground drainage, and in diminishing the violence of floods has not been mathematically proved, we are not justified in basing any extensive measures or any proposals for large expenditure on this account upon the assumption that the indirect influence of forests will be beneficial in the manner here indicated.

198. The matter then stands thus: It is certain that the maintenance and improvement of forests in this Presidency will protect the soil on the slopes of hills, and will diminish the silt carried down into tanks and rivers, and it is probable that a further result will in course of time manifest itself in this way, that as the forest on the hills gradually improves and gets more dense and compact, the springs and streams which have their origin in these forests will retain water longer in the dry season and will be less exposed to sudden floods.

The practical conclusion is that we are justified in taking action for constituting and improving reserved forests, in the hope of securing to the country some of the advantages here named.

199. Such action, however, may be taken on a larger or smaller scale, and progress may be accelerated or retarded by employing a larger or smaller staff and by spending money more or less freely. Under existing circumstances it may be assumed as certain that the constitution of reserved forests and the settlement of rights therein will be a protracted business, unless a large staff is employed and a large outlay is incurred. And naturally Government will be more disposed to expend money and the time of its officers upon this business, if the indirect beneficial effect of forest protection is assured than if it is uncertain. And there is another point. In many cases it will be quite impossible to bring the area which governs the head-waters of a river into a satisfactory condition without extending operations to the forests of Zemindars and other landholders, and this in the majority of cases will only be possible under the Forest Act. Naturally, and most properly, Government will be most unwilling in such cases to enforce the provisions of the Act, except on the clearest evidence that such action is necessary for the welfare of the country.

200. The present position is as stated in the Report of the Indian Famine Commission:—

"As to the protection of the higher hill slopes from denudation, it may confidently be stated that they will, in any case, be more useful if kept clothed with wood than subjected to the wasteful and destructive process by which they are brought under partial and temporary cultivation, and that, whether the expectation of an improved water-supply as a consequence of such protection is fully realized or not, there is on other grounds sufficient reason for arranging for the conservation of such tracts where it is practicable."

Without a more certain knowledge than we at present possess regarding the effect of forest protection, such action will however often be considered to be not practicable. Action should be taken in the direction of forest conservancy because the probability is in favor of the opinions here set forth; but simultaneously with such action a series of scientific researches must be set on foot, in order to determine to what extent forest conservancy will be beneficial in regulating floods and in increasing the water-supply in tanks, springs, wells, and rivers.

Appointment of Special Officer.

201. It appears to me necessary that for this purpose a competent and experienced Engineer-officer should, as a temporary measure, be attached to the Madras Forest Department.

The main point to be determined is, whether the condition of the forest has any effect in increasing the water-supply of rivers during the dry season. For this purpose it will be necessary to study continuously during a series of years a number

of selected catchment areas, to determine for each area the total quantity of rain which falls upon the ground at different seasons, and to measure the discharge of the main river as well as of smaller streams and springs. The results of each year should be reviewed separately. If forest protection in these catchment areas makes real progress, changes will gradually take place in the relation between the rain which falls upon them and the discharge at different seasons of streams which take their rise in them, and from these changes conclusions may then be drawn upon the effect of forest in regulating the surface and underground drainage.

202. Broadly speaking it may be said that the rivers which irrigate this Presidency may be divided into two classes; those which are fed by the south-west monsoon on the Western Ghâts, and those which have their head-waters in the dry inland districts. The following figures will show the great difference in the proportion of the annual discharge to the catchment area in the rivers of these two classes. The figures of this statement are approximate only, and are entered in round numbers:—

—	Anicut where discharge measured.	Catchment Area above Anicut.	Discharge in Millions of Cubic Feet.	
			Total.	For each Square Mile of Catchment Area.
Rivers which have their head-waters in the Western Ghâts.				
		Sq. miles.		
1. Godávari	Dowlaishweram	116,000	3,360,000	29
2. Kistna	Bezváda	97,000	2,740,000	28
3. Bhavâni	Kodivelly	1,900	77,000	37
4. Nóyil	Chittrachavady	90	5,000	58
5. Tâmbraparni	Srivaikuntham	1,739	60,000	34
Rivers which have their head-waters in the Inland Districts.				
6. Pálár	Arcot	3,000*	14,000	5
7. Cortelliar	Tamampati	1,300	11,000	8
8. Cheyár	Tandri	650	3,500	5

* The Mysore area (1,000 square miles), which as a rule gives no water lower down, has been deducted from the total catchment area (4,000 square miles).

The small water-supply in the case of the eastern rivers is not however solely due to the less rainfall in the inland districts, but also to the circumstance that the water of these rivers is used for irrigation all along their course, to a much greater extent than is the case in the Godávari, Kistna, Bhavâni and Nóyil rivers, above the anicuts. This remark does not however apply to the Tâmbraparni, from which river it is estimated that 20,000 millions of cubic feet are drawn annually for irrigation, including waste, above the Srivaikuntham anicut. The total annual water-supply in this river therefore (80,000 millions cubic feet) amounts to 46 millions cubic feet per square mile of catchment area.

203. In order clearly to set forth the scope of present proposals, it will be convenient briefly to review the chief of the minor rivers which have their catchment area within the Presidency, as well as some of the tributaries of the Cauvery. But I may as well at once state my conclusion, which is this, that, if the necessary arrangements can be made, the first rivers to be taken in hand should be the Nóyil river in the Coimbatore and Cheyár in the North Arcot District. Both these rivers will be in the Southern Forest Circle. Should it not be convenient to commence operations in the catchment areas of these streams, there will be ample and most important work for the Engineer, proposed to be employed, in the drainage area of one of the branches of the Cheyér, a feeder of the Pennér river in Cuddapah, which will be in the Northern Forest Circle. In that case a floor with side walls, to measure the discharge of the river that may be selected, must be constructed. A large area of important forests which will, I assume, be efficiently protected, is on the head-waters of the Cheyér, and in the dry climate of the Cuddapah District it will be most instructive to watch the influence of forest protection upon the water-supply in the feeders of that river. Having explained this, I now proceed briefly

to review the streams, over the catchment areas of which the researches here proposed may be extended, in case the streams named should not be found practicable, or in case it should be found feasible to extend the researches further.

Tambraparni.

204. The drainage area of the Támbraparni river in Tinnevelly above the Srívaikuntham anicut in Tenkarai Taluk is 1,739 square miles, of which 1,389 are in the plains and 350 square miles in the hills on the eastern slopes of the ghâts. The total area of occupied land classed in the accounts as irrigated by this river and its affluents is 105,900 acres, of which 93,150 acres are assessed as capable of yielding two crops a year. The area actually irrigated in Fasli 1290 (1880-81), taking first and second crop together, was 169,549 acres, of which at least 64,000 bore two crops. The details appear from the following statement received from the Collector of Tinnevelly :—

Fasli.	Single or Double Crop Land.	Occupied Area.	Of which Cultivation.		
			First-crop Area.	Second-crop Area.	Total Area.
		ACRES.	ACRES.	ACRES.	ACRES.
1290 ..	Double crop	93,154	86,187	71,029	157,216
	Single crop	12,724	10,629	1,703	12,333
	Total ..	105,878	96,816	72,732	169,549

The peculiarity of the catchment area is, that along the crest of the ghâts the mean annual rainfall is as high as 200 inches, and that though the fall is heaviest in the months from May to November, there is rain in all months of the year at that elevation. Again, in the plains the rainfall is heaviest during the north-east monsoon. Thus the fall in the hills and on the plains compensate each other and the result is an even discharge throughout the year in the lower part of the river.

The following figures, which, like the other data relating to catchment area and discharge of rivers, were kindly furnished me by the Chief Engineer for Irrigation, will explain. They are the averages of nine years and give the mean depth per month in front of the head sluices of the Srívaikuntham anicut and the discharge per month in millions of cubic feet :—

Month.	Average Depth of Water in Feet per Month in front of Head Sluices, from 1873 to 1881.	Average Discharge per Month in Millions of Cubic Feet.		
		North Main Channel.	South Main Channel	Total.
January	2·98	571	664	1,235
February	2·27	309	373	682
March	2·83	511	632	1,143
April	1·50	143	178	321
May	1·54	157	196	353
June	2·85	484	581	1,065
July	2·77	487	581	1,068
August	2·31	342	422	764
September	2·07	278	350	628
October	3·13	608	755	1,363
November	5·02	1,405	1,691	3,096
December	5·06	1,480	1,783	3,263
Total ..	..	6,775	8,206	14,981
Add surplus water ..	..	..	..	44,604
Total discharge ..	..	..	..	59,585

Above the anicut the irrigation aggregates about 136,000 acres, which, at the rate of 5,000 cubic yards or 135,000 cubic feet per acre, probably abstracts about

20,000 millions of cubic feet of water annually, making allowance for evaporation, absorption and other waste, so that the total annual water-supply of the river may be estimated at 80,000 millions of cubic feet.

205. The task is to determine the relation between the total quantity of rain which falls upon the catchment area during a certain period and the water-supply to the river during the same period.

Obviously the first point to be aimed at must be to divide the drainage area into belts of approximately equal rainfall; but it should be clearly understood that these belts cannot be laid down at once, but must be the result of observations steadily continued during a series of years. The belt of heavy and almost continuous fall near the crest of the ghâts will probably be found to be narrow, the lower limit running more or less parallel with the crest. On account of the heavy fall this belt will be found to yield a considerable proportion of the entire water-supply, and it will be necessary to place a number of rain-gauges in it, both in the northern and the southern part of the catchment area.

These gauges must be so constructed as only to require to be read periodically, say once in two or three months. Lower down a second belt will be found with a less rainfall, and more limited to certain seasons. The total quantity of water falling upon this belt also should be determined by establishing a number of rain-gauges to be read periodically. Lower down again a third belt should be established in which the mean annual rainfall will probably be found to be between 30 and 50 inches, and here also a number of gauges should be established at convenient points. Experience must show whether the catchment area in the hills must be divided into three or more such belts.

The whole of the arrangements necessary to carry out this plan will entirely depend upon the progress which may be made in putting these forests in order, and traversing them by a system of paths as explained in the chapter of this report which deals with the Tinnevelly forests. Each rain-gauge station must, as a matter of course, be easily accessible; and when the rest-houses proposed to be built in these forests are constructed, rain-gauges should be established at each of these rest-houses.

The total length along the ghâts of the Támbraparni catchment area is about 50 miles, and it is most probable that the rainfall in the northern part at the head-waters of the Chittár river is considerably less than that at the southern end of the catchment area in the Nangunéri Taluk. This must be taken into consideration, and it will be well, at the outset, to establish rain-gauges near both the northern and southern end of the area.

206. So far regarding that portion of the catchment area which is situated within the hills. Regarding that part which is in the plains, the work of collecting observations will be more simple. Rain-gauge stations exist already at the head-quarters of taluks, and others can in that part of the country without difficulty be established so as to obtain a correct idea regarding the quantity of water which falls upon this portion of the catchment area. The mean annual fall at Ambá-samudram is 35 and at Tinnevelly 30 inches, and it will probably suffice to have two or three regions in the catchment area in the plains. That portion of the catchment area which is situated in the Courtallam gap, west of Tenkási, will probably have to be formed into a separate block independently of the belts proposed to be made parallel to the crest of the ghâts. A portion of this block is situated in Travancore, and permission should be obtained to establish rain-gauges here also.

207. It will require some time and experience before the different belts here indicated can be satisfactorily established, and it will be necessary at the outset to commence with a few stations, and to lay down the belts of rainfall on the map, as seems most likely to be in accordance with facts. As the rain-gauge stations are multiplied, the preliminary division of the catchment area into belts of equal rainfall will be corrected. At the end of each year the best possible estimate must be made of the quantity which actually fell upon the total catchment area. Obviously the result can never be anything but an approximate estimate, but it will be more accurate every year, and a further advantage of the greater accuracy obtained, as the observations continue, will be that the results of previous years can be corrected, and that thus the conclusions based upon incomplete observations

can be amended and utilized. What I mean to say is, that the observations of the first few years, though based upon incomplete data, can hereafter be utilized, by interpolating from the data observed in subsequent years the probable quantity which fell during the earlier years, when observations were incomplete.

208. Regarding the construction of these gauges, it will probably be necessary in the belts of heavy rainfall below the crest of the ghâts to use vessels of metal, unless indeed casks of wood can be made sufficiently water-tight. The size of the vessels cannot of course be the same at different places. This must depend upon the arrangements that can be made for measuring the water collected once a month or at longer intervals, and upon the quantity likely to be collected between two visits. Where the rainfall is less, and where the stations can be visited often, glass bottles are certainly the best. Mr. Hutchins, Deputy Conservator, Mysore, who has devoted much attention to the construction of rain-gauges placed at forest stations which can only be read at long intervals, finds that whatever the pattern of the gauge may be, it is necessary to have two instruments side by side, one to measure the rainfall and the other to measure the amount of evaporation.

209. Apart from the receiving vessels, which must differ according to circumstances, the gauges should all be of the same pattern, and the pattern should be selected in consultation with the Meteorological Reporter to the Government of India or other competent meteorological authority. It needs not to be explained that these gauges should all be placed at the same elevation from the ground, and in an open place, away from the drip of trees. Some difficulty will probably be experienced in the ghât forests in making these gauges safe against wild elephants and other animals. Upon the whole there are so many points to be considered in the establishment of these rain-gauge stations that I cannot sufficiently urge the importance of proceeding gradually in this matter.

210. So far regarding the determination of the total rainfall upon the catchment area. The water-supply in the Támbraparni river must be measured at the most convenient point in its course. The most useful plan would be to make the measurements at the uppermost anicut below the hills, where the highest channel leaves the river. In that case separate measurements would be made, giving the discharge of each large feeder, the Chittár, the Támbraparni and others. On the Támbraparni proper I am informed that there are head-sluices at all, except the first anicut close under the hills, and that it will therefore be necessary, if a head-sluice at that anicut is not built, to construct a floor with side walls, on which the discharge of the channel taken off above the anicut may be measured. On the Chittár the head-sluices have yet to be built.

If a place lower down is selected, such as Srívaikuntham anicut, where the measurements are taken at present, an allowance must be made for the water taken off from the main river above that point for irrigation, and this will introduce a considerable element of error.

This is one of the first and most important points which will have to be considered in this matter. When it can be managed, the most useful arrangement will, as a rule, be to measure the discharge of each feeder separately, and to determine separately for each catchment area the rainfall of the year. Whenever it can be done, the discharge of the river should be measured by self-registering gauges, so that floods, which may occur during the night, can be recorded. Two points may be named as the chief object of these researches, *first*, the relation between the total rainfall during the year and the water-supply to the river during the same period, and *second*, the changes which may take place in the water-supply during the comparatively dry season.

211. It will probably also be found very useful during the comparatively dry season, say in February or March, to measure the discharge year after year of selected minor streams in the hills, wherever a rocky gorge or other suitable locality facilitates such operations. I would further recommend that the level of the highest floods in a rocky gorge at certain seasons be determined, which can generally be done by observing the recent deposits of grass or leaves in the branches of trees, or by noting the water-mark on a face of rock.

All these observations, if continued during a series of years and carefully reviewed every year in connection with the quantity of rain of which they are the result, will enable the officer charged with this work to draw conclusions which will be confirmed or corrected as the work progresses. That portion of the Támbraparni catchment area which is situated in the hills has the advantage of being stocked to a considerable extent with evergreen forest, but large tracts are bare and others are stocked with deciduous forest, the trees being scattered among high grass which is burnt annually. By measuring, during the dry months, the discharge of tributary streams, it may be possible at the end of several years' observations to form conclusions regarding the velocity with which the water runs off from tracts stocked with different kinds of forest, and of tracts which are bare, rocky, or which have become denuded.

212. If the forests on the catchment area at the disposal of Government are really constituted reserved forests under the Forest Act, and if the Forest Officers are successful in protecting selected blocks against fire, the gradual improvement of these blocks will doubtless result in an increased discharge, during the dry months, of the streams rising within them, and this I apprehend will be the first tangible result of the system of observations here proposed to be established. I have no doubt that a complete system of observations, if set on foot on the Támbraparni river in the manner here indicated, will lead to most important results, provided the protection of the forests is successful. But the task is large and difficult, and it is not certain how far an efficient protection of the forests can be carried out. The chief difficulty is that a large portion of the catchment area of this river is private land, the forest on which, unless Chapter IV of the Forest Act is enforced, may be cleared and burnt to an extent which cannot be foreseen, thus greatly altering the conditions which influence the water-supply of the river.

Under these circumstances I recommend that the commencement of observations in the Támbraparni basin be postponed, until forest matters are further advanced, and until more experience has been gained in the catchment area of a smaller river.

Vaigai.

213. The second river, on the catchment area of which a system of observations similar to that suggested for the Támbraparni, may be expected to give useful results, is the Vaigai river, which flows by the town of Madura. The catchment area above the Chittani anicut is 1,390 square miles, of which 870 are in the plains and 520 in the hills. Although this river has a much larger catchment area in the hills than the Támbraparni, its water-supply is most uncertain. Unfortunately, however, the greater part of the catchment area is included within Zemindari estates and is not at the disposal of Government, and there is but little hope of effecting much improvement by means of forest conservancy in the drainage basin of this river. The establishment of a system of observations here can probably not be taken in hand until some progress has been made in the researches set on foot on other rivers, and until it can be seen whether action on a sufficient scale in the direction of forest conservancy on the catchment area of this river is feasible. If the project of leading the waters of the Periár river into the Vaigai is carried out, this will so completely alter the water-supply of the latter river that the study of the rainfall upon its catchment area would not be of much practical value.

Noyil.

214. The third river which I would name is the Nóyil, which rises in the Bolampatti valley and irrigates a large area in the Coimbatore and a smaller area in the Palladam taluk. The total catchment area of this river is 1,356 square miles, of which about 60 square miles are in the hills. It irrigates 16,366 acres. In his preliminary report on the Bhaváni Regulation Scheme, Major Montgomerie gives the following statement of the drainage area, with the estimated mean annual rainfall in each belt, and the water calculated to be supplied from each belt to the Cauvery river. The figures of rainfall and water-supply are estimated and must be taken for what they are worth :—

Areas Drained.	Annual Rainfall.		Per cent. of Rainfall run off.	Water supplied (calculated).
	Inches.	Total Quantity fallen.		
SQUARE MILES.		MILLIONS C. FT.	PER CENT.	MILLIONS C. FT.
4	125	1,162	69	802
20	100	4,646	65	3,020
25	75	4,356	59	2,570
25	50	2,904	48	1,394
80	25	4,646	22	1,022
922	20	42,840	15	6,426
280	17	11,158	11	1,227
1,356	..	71,713	..	16,461

The area drained being circumscribed and easily accessible from Coimbatore, it will not be difficult to establish a system of rain-gauge observations similar to that suggested for the Támbraparni.

215. The greater part of the hills from which the Nóyil derives its water has become denuded, and it will be one of the first large tasks to be undertaken by the Forest Department, to constitute such portions, as are at the disposal of Government, reserved forests, and to place them under efficient protection. In this case the necessity of prompt and effective action is so great that success must be secured whatever the difficulties may be; here, therefore, an excellent opportunity will be afforded to test the effect of forest growth upon the water-supply in the river. For this reason, and on account of the vicinity of the area to Coimbatore, I recommend that the Nóyil river be taken in hand first of áll and that during the first year or two the officer entrusted with this duty should devote the greater part of his time to the study of this stream. The experience which will here be gained will be of great use in the study of the Támbraparni and other rivers which may hereafter be selected. At the Chittrachavady anicut, above which the catchment area is about 90 square miles, the total annual discharge of the Nóyil river is 5,181 millions cubic feet, while the rainfall upon this area may be estimated to amount to 14,000 millions of cubic feet. The question is, whether, as the forest growth on a portion of these 90 square miles improves, the proportion of discharge to rainfall will increase, and whether the water-supply will improve during the dry season.

The first point will be to determine the locality where the discharge of the river shall be measured. In this case it will probably be necessary to make special arrangements for this purpose. I would suggest that, if possible, the measurements be made at the upper anicut above the point where the highest channel branches off from the river. If this is done, the catchment area above this point will be limited, and in other respects the problem to be solved will be considerably simplified. If the measurements are made at a lower place, allowance must be made for the water withdrawn for irrigation.

Bhavani.

216. The Bhaváni river, which is formed by the junction of the Bhaváni with the Moyár, offers unusual facilities for the study here suggested, because the most important part (as regards rainfall) of its catchment area is situated on the Nílgiris and on the hills of the Attapádi valley, much of which is easy of access and healthy at all times of the year. At the outset I would recommend that the annual review of the water-supply in this river, and its relation to the rainfall of the year at different seasons be made in a somewhat summary manner, the existing rain-gauge stations, with the addition of a few in special localities being chiefly utilized. Rain-gauge observations are now made at most plantations on the Nílgiris, and at many of these the observations are probably very accurate.

217. Major Montgomerie has, in his preliminary report on the Bhaváni Regulation Scheme, made a commencement in this respect. In the same manner as in the case of the Nóyil river, he has divided the catchment area of this river

into belts of supposed equal mean rainfall and the results given by him are as follows:—

Section of Drainage Area.	Area Drained.	Annual Rainfall.	
		Rainfall.	Total Quantity fallen.
	SQUARE MILES.	INCHES.	MILLIONS C. FT.
Moyár river	4	125	1,162
	10	100	2,323
	30	75	5,227
	190	50	22,070
	464	25	26,949
Bhaváni, above junction with Moyár.	32	125	9,293
	111	100	25,788
	132	75	23,000
	290	50	23,000
	238	25	13,823
	100	20	4,646
Bhaváni, from junction to Kodivelly anicut	56	25	3,252
	105	25	6,098
	173	20	8,038
Total ..	1,935	..	174,670

218. The average annual discharge of the Bhaváni river at the Kodivelly anicut has been found to be 76,649 millions of cubic feet, or 44 per cent. of the annual rainfall, while the discharge of the Nóyil amounted to 37 per cent. The discharge at that place is greatest during the south-west monsoon and lowest from February to April, as will be seen from the following figures which give the average monthly discharge calculated from the figures of six years, from 1873 to 1878, in millions of cubic feet:—

January	2,230	September	8,316
February	1,780	October	9,333
March	1,360	November	8,268
April	1,562	December	6,290
May	3,182		
June	10,602	Total ...	76,649
July	15,026		
August	8,700		

Here, as in the Támbraparni, the well-sustained discharge during nine months of the year, from May until January, is due to the fact that the western portion of the area is exposed to the full force of the south-west monsoon, while the eastern edge of the Nílgiris gets a large share of the north-east monsoon.

219. The following is a rough comparison of the discharge at the Srívaikuntham and Kodivelly anicuts and of the catchment area above those anicuts, of the Támbraparni and Bhaváni rivers:—

River.	Anicut where discharge measured.	Catchment Area above Anicut in Square Miles.			Mean Annual Water-supply in Millions of Cubic Feet.		
		Plains.	Hills.	Total.	Expended in Irrigation above Anicut.	Discharge at Anicut.	Total.
Támbraparni	Srívaikuntham ..	1,389	350	1,739	20,000	60,000	80,000
Bhaváni	Kodivelly.. ..	735	1,200	1,935	..	76,649	76,649

A summary review of the total quantity of rainfall which the drainage area of the Bhaváni river above the Kodivelly anicut receives every year, and of the discharge at that anicut will furnish useful data for comparison with the results obtained by the study of other rivers.

Eastern Rivers.

220. So far regarding the streams which take their rise in the Western Ghâts and are fed chiefly by the south-west monsoon. It is equally and perhaps more necessary to study the influence of forest protection in the case of those rivers which take their rise in the centre of the Peninsula, and the catchment area of which has a comparatively dry climate.

I desire to draw special attention to the Vellár, Ponniár, Cheyár, Pálár and Pennér.

221. The *Vellár* has the advantage of having its entire catchment area calculated at 2,660 square miles above the Shatia tope anicut, within British territory. It rises in the Atúr valley of the Salem District and receives feeders from the Kalráyan, Kollimalai, and Pachaimalai hills. On the slopes of these hills large areas are at the disposal of Government, and it is proposed to include portions of them within reserved forests.

The *Ponniár* is a much larger river, which irrigates considerable areas in the Salem and South Arcot Districts, and the catchment areas of several of its feeders will, it is hoped, ere long be included within reserved forests. But no less than 1,541 square miles of the total area drained by it (5,070 square miles above the Trikalore anicut) are situated in Mysore. Of the Mysore area 85 per cent. is intercepted by tanks.

The *Pálár* irrigates much land in North Arcot, and feeds numerous tanks in that district and in Chingleput. It rises in Mysore, where 1,036 square miles of its catchment area are situated. But the entire drainage from that area is intercepted by the tanks of the Ramsagar series, and in ordinary years no water runs off into North Arcot.

222. More suitable to make a commencement of these observations than the Pálár itself is the *Cheyár*, a large feeder joining it from the south, which drains the Chengam valley between the Javádis and the Thenmalais, and which also receives large feeders from the eastern face of the Javádis.

I am disposed to suggest that operations be commenced on a small area in the first instance, and would suggest the Cheyár for this purpose, the discharge being measured at the Tandri anicut. The annual discharge at this place is 3,461 millions of cubic feet, the catchment area being 650 square miles. In this area it will probably, at the outset, suffice to establish say half a dozen rain-gauge stations on the Javádis and Thenmalais, and the same number below the foot of the hills. The mean annual rainfall at Pólúr is 35 inches, and this probably very nearly represents the fall in the plain portion of the drainage area, while on the Javádis the fall is probably not much over 45 inches. The study of this small area year by year, as forest conservancy progresses, is likely to yield definite results within a comparatively short period.

The *Pennér* (catchment area 20,000 square miles), on which the large Sangam anicut is under construction, also rises in Mysore, as well as two of its feeders, the Pápagni and Chitrávati. Of the drainage area situated in Mysore (2,280 square miles), 85 per cent. is intercepted by tanks.

223. For each of the nine rivers here named, and for as many more as can conveniently be arranged, excepting those which it is proposed to take in hand specially, a summary review should each year be prepared, setting forth the quantity of water which fell upon the catchment area during the year and the water collected in the river during the same period. The result of these annual reviews will gradually, as forest conservancy progresses, lead to important conclusions. At the same time it will be an advantage to make observations on a smaller scale, wherever areas comprising the drainage basin of rivers are placed under effective protection, and these observations should be directed upon the following points :—

The measurement of the discharge, during the dry season, of small streams or springs, which for this purpose must be provided with a built-up outlet or spout.

The water-level during the hot weather in wells in valleys, by which the underground water stratum is tapped. Such wells should be constructed for the purpose; they need only be of small diameter and they should not be used for irrigation.

In a few cases the dry-weather level of water in tanks which are not used for irrigation may give valuable data.

Lastly, the height of floods should be noticed wherever opportunities offer in narrow gorges, on trees and on the face of rocks.

Many of these observations may be made by the local Forest Officers, but they should be subject to the control of the special officer proposed to be appointed, to whom the record should be periodically communicated, and whose duty it would be to review the results at the end of the year and to draw such conclusions from them as may occur to him.

224. The whole of the year's work, including the detailed study of the catchment areas specially taken in hand, the summary reviews of the year's water-supply in the rivers named, and the minor observations to be made by the local officers wherever forests are taken in hand for efficient protection, should all be embodied in an annual report to be prepared by the special officer. The official year is a suitable period for these reports, as the commencement of it falls during what in most districts is the driest season of the year.

225. If the suggestions embodied in the preceding paragraphs are accepted and carried out continuously during a series of years, our knowledge regarding the influence of forests upon water-supply will gradually be placed upon a firm basis. Regarding the result, the experience gained in other Provinces leaves no doubt in my mind, but it is necessary that this result should be established by precise evidence.

If this is not done, steady progress in forest conservancy to the extent required by the interests of the country is not assured. The objection can and will be raised that forest conservancy has been carried too far, that its indirect advantages are imaginary and that they have not been proved. As a matter of fact the opinions of the leading men in this Presidency on the subject of forest conservancy have not always been the same, and it is necessary to place so important a business upon a safe footing, beyond the risk of a reaction which might undo all the good that has been accomplished by the labor of years.

CHAPTER V.

ORGANIZATION.

226. The remarks recorded in this chapter will chiefly deal with the agency which must be employed in order to accomplish the objects sketched in the preceding chapters, and generally the objects of forest administration in this Presidency, as set forth in this report. The following will be the chief subjects dealt with :—

Forecast of Receipts and Charges.
Staff of Superior and Subordinate Officers.
Duties of Forest Officers, and their professional training.
Relations between Civil and Forest Officers.
General administrative control.

Forecast of Revenue.

227. A very large increase of both the superior and subordinate establishments will be necessary, if it is intended to place forest administration in the Madras Presidency upon a satisfactory footing; and the first step must be to determine whether the financial prospects of this business admit of the large increase of expenditure which this will entail.

228. Accordingly, I have, with the Conservator's assistance, drawn up a forecast of average receipts, which may be expected to be realised in the different districts during the five years, commencing with 1883-84. For this purpose three Statements (II, III and IV) have been prepared, which are appended to the present report. Statement II exhibits the average annual receipts and charges on account of Forests and Jungle Conservancy, calculated on the actuals of the five years

ending with 1880-81; Statement III gives the actuals of 1881-82; and Statement IV the estimates for 1882-83, with an additional column for the figures of the forecast. It will be necessary to explain the entries in the last-named column district by district.*

229. *Ganjam.*—In 1881-82 there was an exceptional demand for Sálwood sleepers from Calcutta. Hence, the revenue, which up to date had only been Rs. 12,000, rose in that year to Rs. 62,000. This demand, however, has ceased, and it is doubtful whether the estimate of 1882-83 (Rs. 28,000) will be realised. A large quantity of wood (over 10,000 tons annually) is consumed by the Aska Sugar Works, for which a special low seigniorage, 4 annas per ton, is charged. It is under consideration whether the seigniorage for this wood should not be raised to the ordinary rate, in which case an additional revenue of Rs. 20,000 a-year may be expected, but, pending the settlement of this matter, it does not appear safe to enter more than Rs. 20,000 in the forecast.

Vizagapatam.—Under existing circumstances, there is no prospect of an increase. Rs. 1,000 are entered in the forecast, which is the estimate for the current year under Jungle Conservancy.

Godávari.—The Jungle Conservancy revenue has steadily been between Rs. 6,000 and Rs. 8,000, but in the current year Rs. 9,600 is expected to be realised by means of improved supervision. The Forest revenue was Rs. 23,000 on an average during the five years ending in 1880-81, but has since then diminished, owing to the exhaustion of the forests and the competition of the adjoining forests in Jeypore. For the current year the estimate is Rs. 25,000, but it is doubtful whether this will be realised. Under existing circumstances, it is not safe to enter more than Rs. 18,000 in the forecast.

Kistna.—All jungle lands are under Jungle Conservancy, the revenue of which, during the five years ending 1880-81, averaged Rs. 11,000 and rose to Rs. 17,000 in 1881-82. Grazing rents, which, it is believed, formerly amounted to Rs. 20,000 a year, have lately been transferred to Jungle Conservancy from Land revenue. It has been proposed to form reserves and to close these areas against pasture, which may at first somewhat diminish the income from that source. Rs. 30,000 has been entered in the forecast.

Bellary and Anantapúr.—The Jungle Conservancy revenue was only Rs. 2,500 on an average during the five years ending 1880-81, but has risen to Rs. 12,600 in 1881-82. The lease of the Sandúr forests will increase the receipts, and the forecast is Rs. 15,000.

Kurnool.—The Jungle Conservancy lands, which comprise the jungles of the western taluks, have hitherto only yielded between Rs. 2,000 or Rs. 3,000 a year. The jungles are extensive, but the country is very thinly inhabited. Some increase may be expected under efficient management. The Forest revenue was exceptionally low during the five years ending 1880-81,—only Rs. 12,000. This is ascribed to a change in the system of issuing permits and to lax management. An improvement has taken place in 1881-82 when Rs. 29,000 were realised, and in the current year the Conservator expects to realise a similar amount. Some further increase may be expected by the export chiefly of teak, vengay, and bamboos to Cuddapah by the canal; but taking into account all chances of increasing the revenue, it does not seem likely that the total will exceed Rs. 40,000, which figure has accordingly been entered in the forecast.

Cuddapah.—The total revenue of Forests and Jungle Conservancy has been between Rs. 65,000 and Rs. 70,000, and is, in the current year, expected to come up to nearly Rs. 80,000. By improved management of the Jungle Conservancy and by increased sales of timber, it is expected that a gross revenue of Rs. 1,00,000 may be realised, which has accordingly been entered in the forecast.

Nellore.—The average revenue during the five years ending 1880-81 was Rs. 66,000, and rose to Rs. 81,000 in 1881-82. This revenue is chiefly based upon the supply of fuel to Madras from the Government forest of Sríharikót, to which will be added the proceeds of cuttings in the Casuarina plantations. Under good

* Since the above was printed, the audited figures for 1881-82 have been received from the Accountant-General. The following are the correct receipts in the districts named:—

	Rs.	
Bellary and Anantapúr	13,400	Jungle Conservancy.
Chingleput	6,800	Do.

management Rs. 1,00,000 ought to be realised, which has accordingly been entered in the forecast.

North Arcot.—The Jungle Conservancy revenue has risen steadily from Rs. 7,000 to Rs. 34,000 since it has been placed under the District Forest Officer, and may be expected in future to yield on an average Rs. 35,000. The Forest revenue was Rs. 28,000 on an average during the five years ending 1880-81, and Rs. 41,000 in 1881-82. It may safely be estimated at Rs. 35,000, making the total entered in the forecast Rs. 70,000.

Chingleput.—The Jungle Conservancy revenue during the five years ending 1880-81 was Rs. 10,000, and has since diminished to Rs. 6,000, because the forests which yielded fuel for Madras have been closed; and this is the amount entered in the forecast.

Salem.—The Jungle Conservancy revenue, which averaged Rs. 30,000 during the five years ending 1880-81, rose to Rs. 42,000 in 1881-82. The normal Forest revenue hitherto, may be put down at Rs. 60,000, which will be increased by Rs. 10,000 from grazing dues, head-loads of fuel, and minor produce, so that estimating the Jungle Conservancy revenue at Rs. 30,000 only, a total of Rs. 1,00,000 may be expected.

South Arcot.—The Jungle Conservancy revenue has gradually risen since it was placed under the District Forest Officer, and may, for the future, be estimated at Rs. 12,000. The Forest revenue, which was only Rs. 9,000 during the five years ending 1880-81, rose to Rs. 13,000 in 1881-82, and may be increased by grazing dues and sale of timber up to Rs. 18,000. Accordingly, the entry in the forecast is Rs. 30,000.

Trichinopoly.—The Jungle Conservancy revenue has risen from Rs. 3,500 in 1877-78 to Rs. 12,000 in 1881-82, which figure may be entered. The Forest revenue has hitherto been unimportant, but may be increased up to Rs. 8,000 a year by the sale of fuel to the railway and to the large towns in the Trichinopoly and Tanjore Districts. Accordingly, the entry in the forecast is Rs. 20,000.

Tanjore.—Only Jungle Conservancy. The amount entered in the forecast is Rs. 10,000, which is in accordance with the present realisations.

Madura.—The Jungle Conservancy is expected to yield Rs. 5,000, and the Forests Rs. 25,000, which includes Rs. 7,000, expected to be realised from grazing dues and minor produce. The entry in the forecast, therefore, is Rs. 30,000.

Tinnevelly.—The total revenue from Jungle Conservancy and Forests, averaged Rs. 32,000 during the five years ending 1880-81, was Rs. 33,500 in 1881-82, and is estimated to attain Rs. 38,000 during the current year. The entry in the forecast is Rs. 40,000.

Coimbatore.—Jungle Conservancy revenue was Rs. 15,000 during the five years ending 1880-81, and Rs. 26,000 in 1881-82. It may be estimated in future at Rs. 20,000. The Forest revenue of the current year is estimated at Rs. 80,000, and to this will be added Rs. 10,000 on account of grazing and minor produce. Eventually, when the working of the Anaimalai forests has been put on a regular system, and when roads have been constructed, the revenue by the sale of timber from these forests may be expected to be very considerable, but, for the present, it must suffice to enter Rs. 90,000 on this account, making the total entry in the forecast Rs. 1,10,000.

Malabar.—The following is the estimate of the revenue expected from the different ranges in this district:—

			Rs.
Wynád			25,000
Nilambúr			50,000
Palghát—			
Timber	3,000		
Railway fuel	2,000		
Bamboos	2,000		
		7,000	
Total ...		82,000	

The entry in the forecast is Rs. 80,000.

Nilgiris.—The average revenue during the five years ending 1880-81 was Rs. 39,000, and the estimate for the future stands as follows:—

	Rs.
Sale of wood from plantations and sholas on the plateau	21,000
Sandalwood	2,500
Teak and blackwood from the Mudamalais	20,000
Seigniorage on timber	10,000
Grazing dues and minor produce	6,500
Total ...	60,000

South Canara.—The normal revenue before 1876 was Rs. 30,000. Since then it has been much less, but it is proposed to resume operations, and it is expected that an average of Rs. 20,000 a year will be realised, which has accordingly been entered in the forecast.

230. The total of the forecast compared with the actuals of previous years and the estimate of the current year stands as follows :—

—	Receipts.	Charges.
	Rs.	Rs.
Average of five years ending with 1880-81 ..	6,28,002	5,63,728
Actuals, 1881-82	8,06,900	6,04,615
Estimates, 1882-83	7,48,690	7,25,820
Forecast for five years, commencing with 1883-84...	9,00,000	9,00,000

The estimate of charges in the forecast will be explained further on.

231. The Jungle Conservancy being a local fund, the unexpended balance is carried over from year to year, and the following statement shows the balance in hand in the different districts at the close of 1880-81, and at the close of 1881-82.

*Balances of the Jungle Conservancy Fund.**

Districts.	On 31st March 1881.	On 31st March 1882.
	Rs.	Rs.
Ganjam	310	310
Vizagapatam	2,880	3,660
Godávari	37,580	43,470
Kistna	4,100	3,910
Bellary	1,790	6,740
Kurnool...	1,450	2,090
Cuddapah	29,380	26,310
Nellore	31,910	36,440
North Arcot	26,720	16,860
Chingleput	14,930	12,150
Madras	1,120	1,120
Salem	79,710	1,06,350
South Arcot	3,380	2,380
Trichinopoly	12,040	14,920
Tanjore	10,150	13,690
Madura	7,110	9,230
Tinnevelly	4,340	3,540
Coimbatore	12,990	24,340
Malabar	...	...
Nílgiris	...	...
South Canara	570	540
Total ...	2,82,460	3,28,050

* The Jungle Conservancy Report for 1880-81 and the audited figures for 1881-82 give the following amounts as the total balance in hand at the end of these two years :—

	Rs.
1880-81	2,83,564
1881-82	3,70,325

It is for consideration whether the balance which may be in hand at the close of the current year may be made available for Forest expenditure in 1883-84.

232. It has been decided, that the entire receipts and charges on account of "Jungle Conservancy" will be amalgamated with "Forests." They have hitherto been classified under *Jungles*, *Plantations*, and *Topes*; but when the amalgamation takes effect the classification prescribed for Forest accounts must be adopted instead. The question might be raised whether receipts and charges on account of "Topes" should not be separated from "Forests" and entered under 'Land Revenue.' The following statement exhibits receipts and charges on this account during the three years ending with 1880-81 :—

Years.	Receipts.			Total.	Charges.			Total.
	Jungles.	Plantations.	Topes.		Jungles.	Plantations.	Topes.	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1878-79 ...	1,33,563	14,656	88,047	2,36,266	48,376	40,784	81,208	1,70,368
1879-80 ...	1,37,587	12,005	1,13,528	2,63,120	56,211	26,535	88,173	1,70,919
1880-81 ...	1,31,395	8,210	96,086	2,35,691	53,527	28,666	86,154	1,68,347
Total ...	4,02,545	34,871	2,97,661	7,35,077	1,58,114	95,985	2,55,535	5,09,634

It will be seen that during these three years, the total revenue on account of Topes exceeded the charges on that account by Rs. 42,000, or Rs. 14,000 per annum.

233. At the outset certainly, my advice is that Collectors should use the agency of the District Forest Officer for the management of the whole Jungle Conservancy business, including topes, particularly in the drier districts, such as Cuddapah, Salem, and Coimbatore. The planting of topes is a matter of very great importance, and it is well that, for this purpose, the Collector should have the advantage of a professional agency.

234. It has been ruled that the formation of topes of trees, other than those to be used for firewood and building and agricultural implements, is not a proper charge upon the Jungle Conservancy Fund. I am disposed to think that in the drier districts of this Presidency any efficient agency that may be available should, within proper financial limits, be employed to increase the number of topes of trees, whether fruit-trees or trees to yield fuel and timber. But even if it should hereafter be decided to withdraw the topes from the control of the District Forest Officer, this would make no great change in the final financial results.

Superior Staff.

235. I now proceed to discuss the forecast of charges, and to submit my proposals regarding the increase which must be sanctioned in the superior staff and subordinate establishments.

It has been recognised that there must be a District Forest Officer in each Civil district, and that in some districts there must be more than one District Forest Officer. Excluding Madras, there are now 21 districts, and I understand that the formation of three new districts,—Ongole, Vellore, and Dindigul,—has been proposed.

236. In the following districts, more than one District Forest Officer will be required:—

(1), (2), (3)	Malabar	...	Pálghat and Chenat Nair; Nilambúr; Wynád.
(4), (5)	Coimbatore	...	North; South.
(6), (7)	Tinnevelly	...	Plains; Ghâts.

If the new districts are formed there will be 28 Forest charges, for each of which a District Forest Officer will be required. They will not all be equally

important, and they may be divided into two classes. There will be 18 charges of the first class which will require a Forest Officer of the superior staff,—a Deputy or Assistant Conservator,—while the remaining 10 will be of the second class and may be entrusted to a Sub-Assistant Conservator. In case the three new districts should not be formed, the arrangement of the charges will be somewhat different. The number of officers required will however remain the same, the difference being that some of the Sub-Assistant Conservators will be in charge of portions of districts under the District Forest Officer. The full number of officers here proposed will be required, whatever may be the arrangement of civil districts in this Presidency.

237. I have come to the conclusion that it is impossible for one Conservator to control these 28 charges, and that two Forest Circles must be formed,—the Northern and the Southern,—with a Conservator for each Circle. I suggest the following arrangement:—

It is an essential condition of success not to attempt too much at the outset, and hence at first the work should be concentrated upon those districts where it is most urgent. Accordingly, I propose, for the present, to leave out of consideration the three northern districts (Ganjam, Vizagapatam and Godávari), which are separate from the others, and which can only be reached by steamer from Madras. In these districts matters must, for the present, remain *in statu quo*. On this understanding, the forests should be placed under the general control of the Conservator of the Northern Circle; but he should not be required to include them in his regular tours of inspection.

The sál forests in Ganjam will probably require attention eventually, but at present the only demand for timber is local, the export of sál sleepers to Calcutta from Gopálpur, which commenced some time ago, having ceased. The Aska Sugar Factory consumes large quantities of wood (estimated at 10,000 tons a year). This wood is the produce of Government land, but the payment made for it is nominal, and the annual forest revenue expected to be realized during the next five years, in this district, is only Rs. 20,000 a year.

In Vizagapatam it does not seem likely that any useful action in the direction of forest conservancy can be taken for some time to come.

As regards Godávari, there are valuable forests in the Rékapalle and Bhadráchalam taluks, and in my report I have submitted an account of the present state of forest management there. But it will also be seen, from the remarks submitted on these taluks, that it is doubtful whether any action can usefully be taken for the protection of their forests. They belong, too, to the Scheduled Districts, which have been specially excluded from the Forest Act.

My advice is that some time hence, after the other districts of the Northern Circle, where forest business is more pressing, have been put into proper order, one of the most competent District Forest Officers be deputed to these Northern Districts with the view of determining, on the ground of an examination to be made by him of the forests in detail, what should be done. Should it then be decided to organize forest business in these three districts, the formation of a separate charge, comprising their forests, may perhaps be found advisable.

As regards the grouping of the remaining districts, I have come to the conclusion, after fully considering the subject, that the Palni hills should be in the Southern and the Nílgiris in the Northern Circle. Conservators of Forests must necessarily, on their tours, undergo much exposure to sun and malaria, and care must be taken of their health. It will, in my opinion, be necessary to arrange matters so that each Conservator shall have the forests of a healthy hill range in his Circle. Experience has shown this to be a good plan, and, wherever such was possible, it has been carried out in other Provinces.

Accepting this suggestion, the districts will be grouped as follows:—

Northern Circle.

1. Ganjam. 2. Vizagapatam. 3. Godávari.	To form eventually a separate charge.	7. Bellary. 8. Anantapúr. 9. Cuddapah.
4. Kistna. 5. Kurnool. 6. Nellore.		10. South Canara 11. Malabar. 12. Nílgiris.

Southern Circle.

13. Chingleput.
14. North Arcot.
15. South Arcot.
16. Salem.
17. Trichinopoly.
18. Tanjore.
19. Coimbatore.
20. Madura.
21. Tinnevelly.

Thus, putting aside the three northern districts, each of the two Conservators will have nine districts. But while in several districts of the Northern Circle work has to be organized afresh, considerable progress has already been made in most of the districts included in the Southern Circle. In the Northern Circle, the dry inland districts of Bellary, Anantapúr and Cuddapah will, besides the Nílgiris, claim the Conservator's first attention; while in the Southern Circle, Coimbatore, Salem and Tinnevelly are those districts which present forest questions of the most pressing importance.

In the Southern Circle, the principal language will be Tamil, while in the Northern Circle the languages are Telugu, Canarese, and, in one district, Malayálám. The forests of the Southern Circle are in adjoining districts, and will form a compact charge; while those of the Northern Circle consist of two portions—the western block, comprising the two coast districts, with the Nílgiris, and the eastern block comprising the remainder. This is a disadvantage, but it cannot be avoided. The Conservator will probably find it most convenient to arrange his tours according to the seasons. During the rains, he will do his work on the Nílgiris; the western districts he will visit in the autumn, the time when they are healthiest; and while his camp marches to Bellary through Mysore territory, he can go round to that place by train.

238. The first-class charges should, as already explained, be held by officers of the classes of Deputy and Assistant Conservator, and it will now be necessary to consider how many officers of these classes will, in addition to the 18 first-class charges, be required for special works.

First, for the charge of the Conservator's Office. When the second Conservator is appointed, it will have to be considered where the head-quarters of the two Conservators shall be fixed. I am of opinion that the Central Office of Accounts and the offices of both Conservators should be at Madras, and that it will suffice to place one officer of standing in charge of the Central Office of Forest Accounts and while Conservators are absent from Madras, in charge of their offices for both Circles. The records would be separate, and there would be a separate staff of Clerks and Accountants for each Conservator; but the control of the Central Offices may be placed in charge of one superior officer. It must be distinctly understood that the two Conservators must be independent of each other, each being the adviser of Government in forest matters for his own Circle. The object of the measure here proposed would be defeated if one Conservator were made subordinate to the other.

239. It will be necessary to have at least two officers to spare to be employed in the selection and demarcation of reserved forests, and to assist Forest Settlement Officers in the enquiry into, and settlement of rights claimed in, forests proposed to be reserved.

240. And, lastly, it is necessary, as explained in another chapter of the present report, to attach a professional Engineer to the Forest Department, whose chief duty will be to study the effect which the protection of the forests will have upon the discharge of certain specially-selected rivers, and particularly upon irrigation. This officer will also be available to set on foot and to superintend the system of observations which must be made to determine the effect of forest conservancy upon the filling of tanks, the discharge of springs and small streams, and upon the water-level in wells during the dry season. His services will also be available for the construction of forest roads, bridges, rest-houses, the establishment of saw-mills and the construction of slides and tramways, which must be built to facilitate the carriage of timber and railway fuel. For all these purposes, an Engineer-officer of some standing and experience must, during a series of years, be attached to the Forest Department. His position will be analogous to that of the Superintendent

of Forest Surveys at Dehra Dún, who is subordinate to the Inspector-General of Forests in all Departmental matters, while in all matters relating to the professional work of the Survey he is under the control of the Surveyor-General of India. In like manner, the Engineer-officer proposed to be attached to the Madras Forest Department will, in all matters relating to his own profession, be subject to the control of the Chief Engineer for Irrigation, while in respect of Departmental matters he will be subordinate to the Conservator of that Circle where he happens to be employed.

It is not necessary at present to decide the question, whether such an officer should be permanently attached to the Forest Department. One of the new appointments proposed to be sanctioned should be reserved, in order to provide for his pay, and should hereafter a change be decided upon, the scale may be reduced, or if it should become necessary to strengthen the forest staff, the vacancy may be filled by a Forest Officer.

At the outset the employment of an Engineer-officer in the Forest Department may be regarded as a temporary arrangement, and the mode in which this arrangement may probably most conveniently be carried out is to reserve an appointment on Rs. 900 per mensem for the purpose, and to transfer the officer who may be selected with the pay of his rank, and on the understanding that his name will be retained in the Public Works Department List, and that he will obtain promotion in that department until his pay exceeds Rs. 900 per mensem, when he must revert to his own line, unless some special arrangement is made to retain him in the Forests. As regards travelling allowances, he should receive the consolidated allowance of a District Forest Officer, namely, Rs. 150 per mensem.

241. If these suggestions are accepted, it will be necessary to sanction a staff of 22 Deputy and Assistant Conservators, who should be on one list for purposes of promotion. The second-class charges will be held by Sub-Assistant Conservators. I propose that the pay of Sub-Assistant Conservators shall be included within the monthly maximum amount sanctioned for subordinate establishments. In other Provinces the pay of Sub-Assistant Conservators is specifically sanctioned by the Government of India; but as regards this Presidency, it may be left to the Government of Madras to settle the pay and number of officers of this class within the limit of the amount sanctioned for subordinate establishments.

242. Proceeding on this assumption, all that remains now to propose is—first, the scale and cost of the superior staff of Conservators, Deputy and Assistant Conservators; second, the amount which should be fixed for the monthly maximum cost of subordinate forest and office establishments, including Sub-Assistant Conservators; third, the appointment of Forest Settlement Officers, who must be employed under the Act while the work of constituting reserved forests is in progress; and, lastly, the total increase in the cost of forest administration which these proposals will involve should be estimated.

243. The first question which requires consideration in connection with the scale of the superior staff is the pay of the two Conservators. The pay of the Conservator of Forests in Madras, as at present sanctioned, is Rs. 1,000, rising to Rs. 1,200 by biennial increments of Rs. 100 a month. For the Conservators in the Provinces under the Government of India, the following scale has been sanctioned :—

3	Conservators,	1st	grade, on	Rs. 1,500
3	„	2nd	„ „	1,250
4	„	3rd	„ „	1,000

giving an average rate of Rs. 1,225 for each of the ten Conservators. For this Presidency the best arrangement will probably be that the pay of the two Conservators should rise by annual increments,—one from Rs. 1,000 to Rs. 1,250, and the other from Rs. 1,250 to Rs. 1,500. In this case the average rate of pay of the two Conservators would be Rs. 1,291 a month.

244. It will be convenient to class the 22 Deputy and Assistant Conservators as much as possible in accordance with the scale which has lately been sanctioned for the Provinces under the Government of India, and accordingly I suggest the following :—

		Average Pay. Rs.	Cost. Rs.
1	Senior Conservator, on Rs. 1,250, rising by annual increments of Rs. 50 per mensem, to Rs. 1,500	1,416	1,416
1	Junior Conservator, on Rs. 1,000, rising by annual increments of Rs. 50 per mensem, to Rs. 1,250	1,166	1,166
3	Deputy Conservators, 1st grade, on Rs. 900 each.	900	2,700
3	„ „ 2nd „ on „ 800 „	800	2,400
4	„ „ 3rd „ on „ 650 „	650	2,600
4	„ „ 4th „ on „ 550 „	550	2,200
4	Asst. „ 1st „ on „ 450 „	450	1,800
4	„ „ 2nd and 3rd grades, on Rs. 350 and 250	316	1,264
24	Officers costing		15,546 per mensem
			or 1,86,552 per annum;
		the average pay of each Officer being	* 648 per mensem.

Assistant Conservators will, on arrival from Home, commence on a pay of Rs. 250 per mensem, which will rise to Rs. 350 on their passing one, and, on vacancies being available, to Rs. 450 on their passing the second, examination in languages and other matters.

The cost of the scale as at present sanctioned is as follows :—

		Per Mensem. Rs.
1	Conservator, average pay Rs. 1,133,* cost	1,133
2	Deputy Conservators, „ „ 700, „	1,400
3	„ „ „ „ 500, „	1,500
4	„ „ „ „ 350, „	1,400
5	„ „ „ „ 250, „	1,250
	Personal allowances to Messrs. Ferguson and Sheffield.	250
15	Officers costing	6,933 per mensem
		or 83,196 per annum;
	the average pay of each Officer being	462 per mensem.

245. The new scale is proposed on the understanding, that the superior staff will be strengthened by the introduction of a number of officers from outside. Regarding this point as well as regarding the number of recruits that will eventually be required to maintain the staff at its full strength, it will now be necessary to submit the following remarks.

246. One appointment of Deputy Conservator should be reserved, as a temporary measure, for the Engineer Officer proposed to be attached to the Forest Department, and the second Conservator as well as two Deputy Conservators must be selected from among the Forest Officers serving under the Government of India. Of this year's young professionally-trained officers, four have been posted to this Presidency. But these officers will not be ready to take up the position of District Forest Officers until they have passed in the languages and otherwise have acquired sufficient knowledge of the country, the people, and of business. Forest business should be placed upon a satisfactory footing at once in as many districts as possible, and hence it will be necessary, as a temporary arrangement, to appoint two passed Civilians as Deputy Conservators of Forests, in order to provide for the charge of the forests in two districts.

247. It obviously is a matter of the greatest importance that, at the outset, sufficient arrangements be made to place the young men who have just come out in a position where they will learn the language as soon as possible and acquire experience. For this purpose they ought to be posted to districts where the organisation of forest business is in fairly good order, and they ought to be placed under District Forest Officers who are competent to instruct them in the general routine of public business, as well as to assist them in becoming familiar with the land-revenue system, the land tenures, and the system of agriculture in their districts.

* *Note*,—The Conservator's pay is Rs. 1,000, rising to Rs. 1,200 by biennial increments; the average rate therefore is—

$$1{,}000 + \frac{2 \times 200}{3} = 1{,}133.$$

In the Provinces under the Government of India it has been decided to select in each Province one or two model divisions in which the organisation of forest business is well advanced, and which will always be in charge of picked officers. To these selected divisions it is intended in future to post young officers from Home, in the first instance, so that they may learn their work under the most favorable conditions. In the Madras Presidency, forest business is not yet sufficiently advanced to admit of the selection permanently of certain districts for this purpose, and in the present case, therefore, special arrangements must be made. My suggestion is that two of these young men should be placed under the two Civilians proposed to be posted to the department as a temporary measure. In this manner, they will get a good training in the business of the district generally, and the professional knowledge which they have acquired in Europe will at once be turned to good account, for the Civilian District Forest Officers will be glad to avail themselves of the advice of their Assistants in professional matters. And it should be distinctly understood that when two of these young officers are sufficiently advanced, they will take charge of the forest in these districts, and the Civilians will then revert to their own line. One of the young men should be posted to the South Arcot District, where forest business is further advanced than in the other districts, and where the administration of Forests and Jungle Conservancy has been amalgamated for more than ten years.

248. The existing staff in the Madras Presidency consists, including the Conservator, of 15 officers, one of whom is absent on furlough. The measures detailed will, therefore, enable Government to fill up the whole of the new appointments as follows:—

Existing Officers		15
Permanent additions.	Officers from India	3
	Recruits from England	4
Temporary additions.	Civilians	2
	Engineer-officer	1
	Total ...	25

Apparently, therefore, one officer will be supernumerary, but by the time the new scale has been sanctioned, another vacancy will have arisen, and there will most probably be officers absent on furlough. It may be regarded as certain that the present proposals will not do more than enable Government to fill up the staff here proposed in a satisfactory manner. For the temporary additions to the staff, and for the three officers proposed to be transferred permanently from the India staff, it will be necessary to reserve, besides the second appointment of Conservator, the three appointments on Rs. 900 and two on Rs. 650.

249. If these proposals are accepted, it may be hoped that a year hence the staff as here proposed will be complete, and it will then suffice, in order to maintain it at its full strength, to ask for two professionally-trained officers from Home in 1883 to complete the staff when the two Civilians revert to their own line. In addition to this, which will be a temporary supply, one man a year, commencing with 1884, will be more than sufficient. The ordinary vacancies in the superior forest staff in the Provinces under the Government of India have been at the rate of 3·8 per cent. a year during the last ten years, and if the same rate holds good for superior Forest Officers in the Madras Presidency, 0·912 men a year will be required.

250. It will now be well to say a few words regarding the prospects under the new scale of the 15 officers of the existing staff. Assuming that the three new appointments on Rs. 900 and two on Rs. 650 are reserved as explained above, the remaining appointments, as compared with those of the existing scale, will stand as follows:—

Existing Scale.	RS.
1 Conservator, on Rs. 1,000, rising to	1,200
2 Deputy Conservators on	700
3 „ „ on	500
4 „ „ on	350
5 „ „ on	250
15 officers.	

Proposed Scale.	RS.
1 Conservator, on Rs. 1,250, rising to	1,500
3 Deputy Conservators on	800
2 „ „ on	650
4 „ „ on	550
5 Assistant Conservators on Rs. 450, 350 and	250
15 officers.	

It will therefore be possible when sanction to the scale now proposed has been obtained, to promote all officers now on the superior staff, who are qualified and who are eligible, provided it is the good pleasure of Government to grant such promotion.

251. To regulate promotion to the superior grades of Assistant Conservator, I recommend that rules similar to those existing in the Provinces under the Government of India be adopted, and that promotion to these grades be given on the passing of certain tests; that is to say, promotion to the grade of Rs. 350 should be made to depend on passing by the lower standard in the vernacular and other matters, and on a certificate being granted by the Conservator of ability to hold charge of a Forest range. Promotion to the first grade on Rs. 450 should depend upon the officer passing by the higher standard, and on his obtaining a certificate of ability to hold charge of a Forest District. The general principle which I maintain in this matter is, that Forest Officers, in order to be really efficient, must in the languages attain the same qualifications as Civilians, and must also pass an examination to show that they are familiar with the principal laws which regulate their business in this Presidency, with the elements of revenue procedure, of land tenure, with the more important trees and shrubs, and the principal features of the agriculture of their district. These rules will apply to the young officers sent out from England. For the officers of the existing staff a set of temporary rules, framed in accordance with existing practice, must be made to regulate their promotion under the new scale.

252. From the preceding remarks, it will be apparent that the essential points of the present proposals are—

First, to strengthen the Forest staff of the Madras Presidency permanently and effectually; and,

Second, to secure better prospects of promotion to the members of the existing staff. Both objects will be attained by the acceptance of the present proposals.

Subordinate Establishments.

253. So far regarding the superior staff; the second point for consideration is the pay of subordinate establishments, including Sub-Assistant Conservators. In the orders from the Government of India Nos. 28-F. and 516-F., dated the 17th May 1878, a sum of Rs. 8,748 per mensem was sanctioned as the monthly maximum cost of subordinate forest and office establishments; and in No. 1262-F., dated the 6th December 1875, sanction was conveyed to four Sub-Assistant Conservators, two on Rs. 200 and two on Rs. 150 per mensem, total cost Rs. 700 per mensem, whose pay, as already explained, will now be included within the monthly maximum amount proposed to be sanctioned for subordinate establishments. The following additions are required to the subordinate establishment :—

(*a*) To provide for the appointment of 10 Sub-Assistant Conservators as District Forest Officers in the minor charges, at the present average pay of officers of this class in this Presidency,—Rs. 175 per mensem,—or at a total cost of Rs. 1,750 per mensem. Of these Sub-Assistant Conservators four, costing Rs. 700 per mensem, are at present included in the sanctioned scale of the superior staff.

(*b*) To provide for the protection and management of the jungles and other lands hitherto under Jungle Conservancy.

The amount sanctioned for "Forests" in 1878 did not include provision for the following districts :—Kistna, Bellary, Nellore, Chingleput, Tanjore, as in these districts there were no Forest establishments. The requirements of these districts must be provided from the amounts that should be added on account of Jungle Conservancy.

254. The following statement shows, in detail, the establishment charges on account of Jungle Conservancy during the last five years classified, as far as such

was practicable. The figures have been taken from returns furnished me by the Conservator.

Years.	Working Charges.	Establishment.							Total Charges.
		Pay of Permanent Establishments.	Survey Establishments.	Commission to Village Officers.	Cost of Public Works supervision.	Miscellaneous.	Advances.	Total. Establishment.	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1877-78 ..	1,24,375	63,450	25	2,253	1,033	6,366	..	73,127	1,97,502
1878-79 ..	1,07,127	57,633	60	1,601	676	2,997	274	63,241	1,70,368
1879-80 ..	99,611	63,245	..	2,339	60	3,662	2,000	71,306	1,70,917
1880-81 ..	97,707	62,354	..	2,626	96	2,540	1,225	68,841	1,66,548
1881-82 ..	1,29,673	68,472	791	3,743	..	10,474	..	83,480	2,13,153*
Average of five years.	1,11,698	63,030	..	..	..	..	..	71,999	1,83,697

It will be noticed that the average outlay on account of pay of permanent establishments during this period was Rs. 63,030 a year, or Rs. 5,252 a month. The estimate for 1882-83 is much higher, as will be seen from the following comparison of the actuals of 1881-82 with the estimate:—

	1881-82.	1882-83.
	Rs.	Rs.
Pay of permanent Establishments	68,472	79,620
Survey Establishments	791	740
Commission to Village Officers	3,743	3,480
Miscellaneous	10,474	12,191
Advances	...	2,340
Total ...	83,480	98,371

Still higher is the total amount of the graded list of Jungle Conservancy establishments, received through the Conservator, from the Board of Revenue, copy of which (Statement V) is appended to the present report. An abstract, showing the annual cost for each district, is entered below:—

District.	Salary.	Allowance†	Total.
	Rs.	Rs.	Rs.
Ganjam	108	...	108
Godávari	1,752	300	2,052
Kistna	15,012	558	15,570
Nellore	25,746	1,740	27,486
Cuddapah	15,828	180	16,008
Kurnool	1,248	...	1,248
Chingleput	3,876	48	3,924
North Arcot	7,020	300	7,320
South Arcot	7,986	...	7,986
Tanjore	6,348	...	6,348
Trichinopoly	3,954	300	4,254
Madura	1,482	...	1,482
Tinnevelly	5,832	...	5,832
Coimbatore	3,480	...	3,480
Salem	13,584	...	13,584
South Canara	180	...	180
Establishment at the Presidency ...	1,596	...	1,596
Total ...	1,15,032	3,426	1,18,458

* The audited figures for 1881-82 distribute the charges as follows:—

	Rs.
Working charges	1,06,343
Establishments	1,07,086
Total ..	2,13,429

† The items entered in this column are supposed to be horse or consolidated travelling allowance.

Except in the case of South Arcot, Kurnool, and South Canara, the items of this statement do not agree with the budget-estimates. In the case of Kistna, the difference is partly explained by the sanction given during the year to additional establishments which are not included in the budget-estimate. Generally, the entries in the graded list are much in excess of the amounts for which provision has been made in the current year's budget. This I am unable to explain, but it is possible that some of the establishments are not entertained throughout the year, or that the pay of some persons, such as maistries, gardeners, and watchers, is not entered under "Establishments," but under "Working Charges" in the accounts.

255. Under these circumstances, it is not easy to determine the amount which should be added on account of Jungle Conservancy to the monthly maximum amount for subordinate establishments. On the one hand, it is most undesirable to sanction larger permanent subordinate establishments than are absolutely necessary, and, on the other, the Conservator should have sufficient means at his disposal for placing the executive, protective, and office establishments upon a satisfactory footing. Again, it may be assumed as certain that the amalgamation of Forests and Jungle Conservancy will enable the Conservator to organise his establishments more economically without impairing their efficiency. At present it is only possible to fix the limit in an arbitrary manner, and, as a temporary measure, subject to revision after, say, three years, and on the understanding that in case of necessity the Government will be prepared to sanction the entertainment of temporary establishments.

I beg to submit the following proposal:—

	Monthly Cost. Rs.	Annual Cost. Rs.
Monthly maximum amount sanctioned for pay of Subordinate Establishment	8,748	1,04,976
Pay of 10 Sub-Assistant Conservators, at an average of Rs. 175 per mensem	1,750	21,000
Additional monthly maximum amount allowed for Jungle Conservancy Establishments	7,002	84,024
Total ...	17,500	2,10,000

This will place Rs. 7,002 a month at the disposal of the Conservator for the pay of the Jungle Conservancy establishments, or Rs. 1,750 a month more than the actual outlay on this account during the five years ending in 1881-82, and Rs. 367 a month more than the amount estimated under this head for 1882-83.

256. It will be useful to compare the monthly maximum amount now proposed for the Madras forests, less the pay of Sub-Assistant Conservators included in the superior staff in other Provinces, with those sanctioned for the Bombay Presidency and some of the larger Provinces under the Government of India; together with the average receipts and charges on account of Forest administration during the last five years:—

Presidencies and Provinces.	Average of five Years ending 1880-81.		Monthly Maximum Amount sanctioned for Subordinate Establishments.
	Receipts.	Charges.	
	Rs.	Rs.	Rs.
Madras	*6,28,002	*5,63,728	15,750
Bombay	13,43,520	9,71,891	12,170
Bengal	4,15,103	2,84,539	6,000
North-Western Provinces and Oudh...	10,92,546	7,58,924	6,916
Punjab	6,16,107	5,07,849	9,083
Central Provinces	8,10,992	4,03,624	4,611
British Burma...	13,97,771	8,09,063	9,606

* Includes Jungle Conservancy Receipts and Charges.

The amount proposed to be sanctioned for this Presidency is thus much larger than that sanctioned for any other Province.

257. If these proposals are accepted, the total outlay on account of pay of permanent subordinate establishments will be Rs. 2,10,000 a year, and it is now necessary to consider to what extent the outlay on account of travelling allowances and contingencies will be affected by the acceptance of the present proposals. As regards travelling allowances, it is not my intention to propose any alterations in the existing rules. That is a separate subject which, if necessary, may be considered after the reorganisation here proposed has taken effect. In the present estimate, I shall assume that the existing travelling allowance rules will remain unaltered. Accordingly, it will be necessary to provide for one additional Conservator at the rate of Rs. 200 per mensem, for seven additional Deputy and Assistant Conservators at the rate of Rs. 150 per mensem, for six additional Sub-Assistant Conservators and for the Jungle Conservancy establishments, as far as they are, under existing practice, entitled to travelling allowances. Accordingly, the forecast under this head may be framed as follows :—

	Annual Outlay. Rs.
Additional Conservator of Forests	2,400
Seven Deputy and Assistant Conservators	12,600
Six additional Sub-Assistant Conservators	3,600
Jungle Conservancy Establishments	3,513
Estimate for 1882-83	55,887
Total ..	78,000

258. The estimate under "Contingencies" in the Forest estimates for 1882-83 is Rs. 8,477. Making a suitable addition on account of Jungle Conservancy, the probable outlay under "B, Establishments," if these proposals are accepted, will be as follows :—

	Rs.	
Pay of Superior Staff	1,75,968	a year.
Pay of Subordinate Establishments	2,10,000	,,
Travelling allowances	78,000	,,
Contingencies	12,000	,,
Total ...	4,75,968	a year, or
say	4,76,000	

Forest Settlement Officers.

259. The preceding remarks relate to the permanent increase required to the superior and subordinate staff. Something more, however, is required as a temporary measure, while the demarcation of reserved forests under the Act will form the chief work of the department. It is laid down in the Act that for the settlement of the rights of the State and of other persons in lands, which it is proposed to constitute reserved forests, Forest Settlement Officers shall be appointed. Whenever it thus happens that the ordinary Settlement operations are in progress in any district in which the constitution of reserved forests is undertaken, as for instance in the Nílgiris at present, it will probably be expedient to entrust these duties under the Act to the ordinary Settlement Officer. But such cases are rare, and, as a rule, a special Forest Settlement Officer must be appointed. For this purpose, it will be necessary to select Civilians of longer standing and greater experience than those whom it is proposed to employ as District Forest Officers as a temporary measure. In future it is hoped that those Civilians who have acquired experience as District Forest Officers may be found qualified to act as Forest Settlement Officers. It has been suggested to me that the selection should be made from among those who are now acting as Sub-Collectors, and that they should receive the allowances of a Sub-Collector, which I am informed are as follows :—

	Rs.	A.	P.
Pay	1,166	10	8
Tentage	87	8	0

with the travelling allowance of Sub-Collectors at the rate of Rs. 6 a-day. Considering the amount of work to be accomplished in this respect, it will, I believe, be necessary during a series of years to employ at least two special Forest Settlement Officers, which will cause an additional charge under "B, Establishments" as follows:—

	RS.
Pay and tentage of two Sub-Collectors per mensem	2,508
Travelling allowance at Rs. 180 per mensem each	360
Total per mensem ...	2,868

or Rs. 34,416, say, Rs. 35,000 a year. In addition to this there should be sufficient provision for office establishments. Each Forest Settlement Officer must have a picked and trustworthy man as the head of the office, and it will be necessary to provide Rs. 250 a month for office establishments for each of the two officers. This will amount to Rs. 6,000 a year, making the total cost on this account Rs. 41,000 a year.

Forecast of Receipts and Charges.

260. Under existing circumstances, it would be quite impossible to frame a forecast of what the charges for "Conservancy and Works" will be after the amalgamation of Forests and Jungle Conservancy has taken effect, but so much is certain that they will be considerably higher than hitherto. The following figures set forth the data upon which my final forecast is based.

The average annual outlay for "Conservancy and Works" during the five years ending 1881-82 and the estimate for 1882-83 are as follows:—

	Jungle Conservancy. RS.	Forests. RS.	Total. RS.
Average annual outlay for the five years ending 1881-82	1,11,698	1,48,354	2,60,052
Estimate for 1882-83	1,57,449	1,90,000	3,47,449

Based upon these figures, the final forecast for the next five years of receipts and expenditure of the amalgamated Jungle Conservancy and Forest Department will stand as follows:—

	RS.	RS.
Receipts		9,00,000
Charges—		
Conservancy and Works	3,83,000	
Establishments, permanent	4,76,000	
Forest Settlement Officers, temporary	41,000	
	9,00,000	

The forecast submitted at the commencement of this report, under which receipts and charges will amount to Rs. 9,00,000, is the nearest approach to an estimate that can at present be framed. Indeed, I deem it right here to state, as the result of my enquiries into forest-matters in this Presidency, that during the next five years, for which the forecast has been framed, and while the operations for constituting reserved forests will, it is hoped, be in full swing, it will probably not be possible to avoid an excess of expenditure over receipts. This excess may, however, be obviated by utilising the balance of the Jungle Conservancy, which in March last was Rs. 3,70,000. Eventually, if forest administration is conducted efficiently, the receipts will doubtless increase considerably. So much will be evident from the figures here submitted, that the financial business of forest administration in the Madras Presidency will require most skilful and energetic control, and no time should be lost in strengthening the superior staff in the manner here suggested.

Duties of Forest Officers.

261. As in the Provinces under the Government of India, the staff of officers will eventually divide itself into three classes, each with different kinds of duties, viz.:—

I. The Controlling staff in charge of Forest Districts.
II. The Executive staff in charge of Forest ranges.
III. The Protective staff in charge of Beats.

But forest administration in this Presidency is not sufficiently advanced, to admit of a sharp separation of the duties of controlling, executive, and protective officers.

As explained in the first paragraphs of this chapter, it will, if the new districts are sanctioned, be necessary to provide for the charge of forests in 28 districts and parts of districts. There will thus be 28 controlling charges, the District Forest Officer exercising control over the whole of the Government forests in his charge, but exercising such control subject to the Collector's orders. The controlling charges therefore may be regarded as finally fixed, for they depend upon the limits of Civil districts. But it is unavoidable at the outset, that the officer who has charge of the forests in a Civil district, or part of a district, should to a great extent carry on the executive management of his forests, chiefly because the present state of the forest revenue does not permit the organization everywhere of ranges or executive charges, and, secondly, because a sufficient number of officers, competent to hold executive charge of a range, is not yet available. Again in many forest ranges protection will, for some years to come, be the chief work.

262. Eventually matters will probably develop in this direction; that controlling charges will be held by Deputy and Senior Assistant Conservators; that executive charges will be held by Junior Assistant Conservators, Sub-Assistant Conservators and Forest rangers; and that protective charges will be held by Foresters and Forest-guards. This is the end which should be aimed at; but at present neither the prospects of revenue nor the condition of the *personnel*, would justify so complete an organization. Under these circumstances, it has been proposed that, for the present, of the 28 controlling charges, 18 shall be held by Deputy and Assistant Conservators, while 10 will be held by Sub-Assistant Conservators. It must be distinctly understood, that under existing circumstances it is out of the question to attempt finality in the forest organization in this Presidency. As regards the classification of the subordinate staff, which it has been decided shall include Sub-Assistant Conservators, nothing more need be said in the present place, except that it will be best to follow the gradation prescribed in paragraph 9 of the Forest Department Code which is as follows:—

	Monthly Pay. Rs.	Rs.
Forest rangers from	50 to	150
Foresters from	15 to	40
Forest-guards from	6 to	12

The pay of Sub-Assistant Conservators under the Government of India is Rs. 200 per mensem.

Qualifications required—Subordinate Staff.

263. So far regarding gradation. As regards qualifications, what is necessary in the case of Forest-guards, in order to ensure efficiency, are local knowledge, a strong constitution, active habits, honesty, and general intelligence. If, with these indispensable qualifications, are combined the ability to read and write in their own language, and to keep simple accounts, such additional qualifications are an advantage; but at the outset there must be many Forest-guards who are unable to read and write, and who may yet be very efficient protective officers.

264. In this Presidency persons in Government employ cannot rise to a pay of Rs. 20 and upwards without having passed the Middle School Examination. In addition to this test, examinations in certain subjects are prescribed, before candidates can be appointed Probationary rangers, Rangers and Sub-Assistant Conservators. I do not desire to suggest any modification of existing rules, but I am of

opinion that it will be a good plan to send as many junior Foresters as possible for a course of study at the Dehra Dún Forest School. Under the orders of the Government of India of the 1st December 1881, candidates for admission to the school must produce the certificate of having passed the entrance examination of an Indian University, which condition can only be dispensed with, in the case of candidates now in the Forest service, provided the Director of the Forest School is satisfied that they have attained such a standard of general education, as will enable them to follow the course of instruction with advantage.

Of the other conditions for admission, I will only mention that no students will, as a rule, be received, who have not proved their fitness for forest work by service in the subordinate staff of the department during a period of not less than twelve months. This is a most important provision which is essential to the good success of the arrangements made, and which should be rigidly observed in this Presidency.

There is this advantageous feature in regard to the utilization by this Presidency of the Dehra Dún Forest School, that all young men, who aspire to rise in the public service, have a knowledge of English, sufficient to enable them to follow the instruction at the school, which is necessarily given in English. Industrious students, who are sufficiently qualified, can obtain the Forest ranger's certificate after a course of sixteen months, and I am disposed to recommend that, as a rule, half the vacancies which may arise during the year in the class of Forest rangers should, after a certain date, be filled by men who hold the Forest School certificate.

Foresters who are not qualified to be sent to the school, or who may fail in obtaining the Ranger's certificate, should only in cases of exceptionally distinguished service be promoted to the class of Forest ranger.

I have repeatedly visited the excellent Agricultural College at Saidápet and have considered whether it might not be used for the education of Forest-rangers. The difficulty is that no Government forests are anywhere in the vicinity and that difficulty cannot be overcome. For the present therefore students must go to Dehra Dún. It is in my opinion an advantage that students sent to that institution will become familiar with forests composed of species not found in this part of the Peninsula and growing in a totally different climate.

265. As already stated, the number of Forest rangers will be small at the outset and must be increased gradually. But I would recommend that a well-arranged scale of Forest rangers be at once established for each circle, so as to give good prospects of advancement to deserving men. Promotion in this, as in other grades of the Forest service, should not necessitate transfer from one range to another. The executive management of the Government forest domains will eventually be entirely in the hands of Forest rangers, and hence obviously a staff of trustworthy, efficient Rangers is the first condition of good forest administration. It may be urged that without honesty and probity efficiency is impossible, and that probity and professional skill are two things apart, which have no necessary connection. But professional education has this great advantage, that it increases the feeling of self-respect. Experience will doubtless show that Forest rangers who have received a thorough professional training will not only be more efficient, by reason of the superior skill and knowledge which they have acquired, but that among them will also be a larger proportion of officers who can be trusted to discharge their duties with integrity and single-minded devotion to their work.

266. The organization of the protective and executive staff must be so arranged, that they are educated by means of the work entrusted to them. The main point to keep in view is that their responsibility, and the extent of the local charges entrusted to them, must be well defined. Regarding the area of beats and ranges I do not attempt to offer any suggestions: that must vary according to circumstances in different districts, and will naturally mainly be regulated by the strength of establishment which the forest revenue may justify. In the beginning beats and ranges will necessarily be large, and as the revenue increases their extent will be diminished, and they will be made more manageable.

267. Forest-guards, and eventually also Foresters and Rangers, should wear uniform or a distinctive badge of office. The residence of each should be fixed in

a convenient locality, carefully selected with regard to good water-supply and otherwise as healthy as circumstances will permit, in the forests or on the outskirts. If in the forests, sufficient land for a garden, field and pasture should be attached to the residence. A house should be built by Government, first temporary and later on permanent, if the locality proved suitable. A considerable proportion of Forest rangers and Sub-Assistant Conservators in the Madras Presidency have hitherto been Europeans and Eurasians. It would, I think, be an advantage to recruit these classes of officers chiefly, if not exclusively, among Natives of India of pure Asiatic descent.

The class of Sub-Assistant Conservators might be used to facilitate the admission into the superior staff of Native gentlemen. If a move in this direction should be decided upon, such candidates would first serve an apprenticeship in the forests in the class of Ranger or Forester, and if found suitable for forest work, they would then be sent to the Dehra Dún Forest School for their professional instruction. It seems most desirable to encourage young men of good family to enter the superior branch of the Forest Department in this Presidency.

Qualifications—Superior Staff.

268. The officers appointed to the superior staff will in future all receive their professional education in Europe, except in special cases when Sub-Assistant Conservators may be promoted to the superior staff as reward for distinguished service. On arrival in India they should, as soon as possible, pass in the language. Under existing rules they are only required to pass one examination in the language of their district. The rules for the examination in the vernacular languages of European and Eurasian Uncovenanted officers, which came into force on the 1st February 1880, recognize three classes of officers—

First Class.—Comprising those who hold appointments usually held by officers of the Covenanted Civil Service. These officers pass the same examinations as those prescribed for the Covenanted Civil Service.

Second Class.—Sub-Judges, Deputy Collectors and District Munsifs.

Third Class.—Officers of other departments, including Conservators, Deputy and Assistant Conservators, Sub-Assistant Conservators and Forest rangers.

For the officers of the second and third classes, two different tests in the languages are prescribed. Besides these a high proficiency test is provided, which is voluntary.

269. As already stated, Forest Officers of the superior staff should be required to pass the same examinations in the vernacular as Covenanted Civilians, and they should be required to pass by both the lower and the higher standard, in the language of their district: provided that, subject to the sanction of Government, an officer may pass by the lower standard in two languages, in which case he will not be required to pass by the higher standard in any language. It should, however, be optional for any officer in addition to the examinations prescribed, to pass by the higher or lower standard, and a high proficiency test in such languages as Government may permit. In such cases he should be eligible for the prescribed rewards.

270. Besides the language test, Assistant Conservators should show some reasonable acquaintance with the trees and shrubs of the district in which they have served, and should be required to pass such examinations in the elements of Law and the Land-revenue system, as may be prescribed by Government. The subjects which I would recommend are the following:—

1. The Madras Forest Act, 1882.
2. The Land Acquisition Act, 1870.
3. The Madras Boundaries Act, 1860.
4. The Easements Act, 1882.
5. The Cattle Trespass Act, 1871.
6. The Penal Code, selected chapters, of which I name the following to illustrate what is intended:—

I. Introduction.
II. General explanations.
III. Punishments.
IV. General exceptions.
V. Abetment.
IX. Offences by, or relating to, public servants.
X. Contempt of the lawful authority of public servants.
XI. False evidence and offences against public justice.
XVII. Offences against property.
XVIII. Offences relating to documents and to trade and property marks.
XXIII. Attempt to commit offence.

7. Code of Criminal Procedure, so far as necessary in connection with the Forest Act.
8. Standing Orders of the Board of Revenue, selected chapters, of which the following may be mentioned:—

Assessment and disposal of lands.
Collection of revenue.
Revenue Courts.
Government law suits.

9. The system of taluk and village accounts.
10. Forest rules of the district.
11. Those chapters of the Forest Department Code which have been adopted in the Madras Presidency.

No examination in surveying need be required from officers who have received their professional education in Europe; but no Sub-Assistant Conservator should be promoted to the superior staff unless he has passed in surveying by the lower standard, as prescribed in paragraph 50 of the Forest Department Code.

271. So far regarding the members of the superior staff who have received their professional education in Europe. Regarding those who have not received such education, advantage should be taken of an arrangement, which was commenced at the Forest School in 1881, and which it is hoped will be continued, to permit officers to come to Dehra Dún during the course of theoretical studies (July to October) to attend lectures, work in the laboratory, and otherwise avail themselves of the opportunities for study which the school affords. I wish also to draw attention to the facilities given in the Forest Survey Branch for Forest Officers to qualify in surveying and to pass by the higher standard; or if they cannot afford the time, to attain the qualification required for the lower standard, as prescribed in the Forest Department Code.

Civil and Forest Officers.

272. Regarding the relations between Civil and Forest Officers, reference is invited to the joint report on organization by the Forest Committee, dated the 9th June, which will be found as Appendix III. That report deals with the subject in a comprehensive manner, and it will suffice in the present place to draw attention to a few points. It has been agreed that the District Forest Officer must work under the control of the Collector, and that he will be the Collector's Assistant for forest business.

It is not proposed to revive the system of 1872, under which the Collector was made the Conservator of Forests in his district. There may have been at that time, and there may be now, Collectors who are excellent foresters; nay, indeed, who are better foresters than many Forest Officers in the Madras Presidency; but, as a rule, the State is best served if each of its servants is employed in his own profession. Forestry is the profession of the forester; the Conservator must be a forester, and it must be his duty to maintain continuity of action and to see that the District Forest Officers act in accordance with correct principles. He must also be responsible for the maintenance of an efficient staff of officers who know their profession, both in the superior and subordinate branches, and the control of personal matters must therefore mainly be in his hands.

273. There must be a District Forest Officer in each district, and he must, under the control of the Collector, conduct the whole of the forest business of the district.

He will be the Assistant to the Collector for all forest matters and the Head of the Forest Branch of the Collector's office. Under such rules for the conduct of business as may be prescribed, he will issue all orders in the name of the Collector, and the Collector must give no orders on forest matters except through the District Forest Officer. On the other hand, the District Forest Officer will not receive his orders from the Conservator, but from the Collector, to whom the Conservator will submit his views and his wishes. All orders of superior authority on forest matters should be communicated to the Conservator, who will be the adviser of Government in forest matters. The Conservator must be responsible for the efficiency of the staff, both in the superior and subordinate branches, as well as for professional matters and financial results. All important questions relating to establishments, professional and financial matters, must be referred to him, and it must be understood that, unless the Collector has strong grounds for a different opinion, he must, in those matters, act in accordance with the views and wishes submitted to him by the Conservator.

On the other hand, it must be understood that the Conservator cannot dictate to the Collector. He must explain his views and wishes, and, if he fails to obtain the Collector's assent, must submit the question to higher authority.

Annual Plans of Operations and Weekly Reports.

274. Apart from an efficient staff, a complete organization, a good forest law, and good rules made under it, several other arrangements are indispensable in order to make the system here sketched efficient.

An annual plan of operations must be framed every year, and its provisions must be agreed upon by the Conservator, the Collector, and the District Forest Officer. And, save in the case of unforeseen events, this plan of operations must be strictly adhered to during the year to which it relates.

Weekly reports of all important business should be sent by the District Forest Officer on every Saturday afternoon to the Conservator. As a rule, these weekly reports should be written on half margin by the District Forest Officer in his own hand-writing; they should be returned to him, through the Collector, with remarks and suggestions by the Conservator. If the Collector objects to any remarks or suggestions made by the Conservator, he will inform the District Forest Officer, so as to guard against action being taken in a manner of which he does not approve, and the District Forest Officer will send a copy of the Collector's orders to the Conservator.

In case of conflicting opinion, the District Forest Officer will, as a matter of course, be bound to carry out the Collector's orders. Should any Collector desire that these weekly reports should be submitted to him in the first instance, before being sent to the Conservator, it will rest with him to issue the needful orders. I do not recommend that Government should lay down any rigid rules regarding this or other matters of business routine; these matters must arrange themselves so as to suit the circumstances in each district.

Again, when the Conservator is in camp with the District Forest Officer, he will be at liberty freely to communicate to him his views and suggestions on professional and departmental matters, but he will inform the Collector of what passes between them. It is essential that the District Forest Officer should be thoroughly posted up in the Conservator's views on all points.

In this manner the Conservator will be kept informed promptly of all that goes on, and will have ample opportunities for impressing his views upon the Collector and the District Forest Officer; but all regular official business must go through the Collector, and the District Forest Officer must not be bound by any orders which have not emanated from the Collector.

Functions of Collectors and Conservators.

275. At first sight this plan may appear to lead to divided responsibility; but, in reality, it will be found, that under a proper organization, a sufficient and rational forest law, and, with the exercise of tact and judgment on both sides, differences of opinion will be exceedingly rare. Should such differences occur,

they must be referred to higher authority for orders. But, as a rule, Collectors and Conservators will find means for reconciling any difference that may arise between them.

In practice the difficulties in this respect will not be found to be considerable, provided it is borne in mind that the District Forest Officer is entirely under the orders of the Collector. It may be arranged that the Collector's correspondence with the Conservator should be conducted by the District Forest Officer, who would, in this as in all other matters, act in accordance with the Collector's orders and instructions.

Government sanctions the scale of establishments, and the appointment, posting and promotion of the superior officers rests with Government. The Conservator controls the appointment, posting and promotion of Forest-rangers and Foresters. The appointment, promotion and dismissal of Forest-guards should rest with the District Forest Officer, acting under the Collector's orders. The Collector should have the power to fine and suspend all officers of the subordinate establishment. The dismissal of Rangers and Foresters should rest with the Conservator who appoints them, but he will naturally as much as possible be guided in his action by the Collector's views and wishes.

The appointment, promotion and dismissal of Sub-Assistant Conservators must rest with superior authority, unless specially delegated to the Conservator.

Professional matters will be regulated by the annual plan of operations and the working plans that must be made for each forest. In the case of unforeseen events reference must be made to the Conservator.

Lastly, in financial matters, the limits within which the year's work must be kept are laid down by the budget orders of Government; but within these limits it rests with the Conservator within the limits of his powers to sanction all outlay which has not been otherwise sanctioned, or which is not provided by the annual plan of operations. Regarding the allotment of the budget grant to divisions and sub-heads, and subsequent transfers, my proposals will be found further on.

276. In practice, differences between Collectors and the Conservator will be very rare, and I submit that it is in no way a necessity that Collectors and Forest Officers should take different views regarding forest matters. As soon as correct principles are fully recognized, Civil and Forest Officers will co-operate for the attainment of the same objects.

The Collector, being on the spot, is the fittest man to control the current work connected with forest business in his district, and in doing so he must allow himself to be guided in departmental, professional and financial matters by the Conservator, who, as Head of the Department, is the proper officer to maintain continuity of action in accordance with the forest policy decided upon by Government.

Another plan might be suggested, to make a division of subjects, so that the District Forest Officer would receive his orders from the Conservator on subjects of a professional and departmental character, while in regard to other matters he would be subordinate to the Collector. Such a division of subjects and control has been attempted in some Provinces, but it is artificial and will, I fear, lead to friction and needless complications.

In the Madras Presidency, where the lands which must be placed under Forest administration are in most cases distributed over the whole of the district, and are not confined to remote corners, the organization here submitted will, I feel assured, be found to be the most suitable. At present the superior and subordinate forest staff is not in a satisfactory state in all districts, but when the staff has become efficient it will be found easy to work the organization here proposed.

277. Nor will this plan, if properly understood and honestly carried out, impose an undue burden of work upon the Collector. The work will be done by the District Forest Officer in the Collector's name. On matters of ordinary routine the Collector will authorize the District Forest Officer to issue orders without reference to him, reporting such orders by weekly returns. Other matters will be referred to the Collector by means of office notes. The District Forest Officer being the head of a branch of the Collector's office will not communicate by official letters with the Collector. It should be distinctly understood that the Collector will not have a separate Forest office, distinct from that of the District Forest Officer. All records

will be kept in the District Forest office, and all business relating to the forest management of the district will be transacted in that office.

The plan here proposed will relieve the Conservator of much office work, and will enable him to spend a large part of the year in the forests with the District Forest Officers.

The practical result of this system will be that it will tend to unite the subordinate Civil and Forest establishments, and if this is accomplished, the administration of forests will no longer be considered as a thing apart from the administration of other Government lands. The present idea, which I have found only too commonly entertained in many districts of the Madras Presidency, that Forest Officers are regarded by the people as their enemies and oppressors, will then disappear, and it will be recognized that those among them who do their duty are the best friends of the people and among the most powerful promoters of their prosperity.

278. I cannot urge in terms sufficiently strong that all business arrangements, such as those here suggested, cannot at the outset be regulated by a rigid set of rules. The plan proposed here, and in the joint memorandum appended to this report, is to some extent new, and it must first be developed by actual experience, before rules to regulate this part of the business can be framed.

The main object which should be kept in view is, to promote the growth of a strong staff of Forest Officers, educated in their profession, who have acquired good experience. These officers will carry on the work under the control of the Collectors, but at the same time with the assistance and under the advice of the Conservator of their circle. The Collector is responsible for the current work, while it is the Conservator's duty to maintain continuity of action, in accordance with correct principles and the policy laid down by Government.

279. I am anxious that my proposals for amalgamating the administration of forests with the civil administration of the country should not be misunderstood. My object is to strengthen the hands of Forest Officers and to give them more real power and influence. The professional character of the Forest Department must not be set aside but must be developed and strengthened. In all countries where a well-organized forest administration exists, Forest Officers must be closely united by the rules and traditions of their service and by their common professional training. And it will be the duty of the two Conservators to foster and to direct the growth of the common professional interest among Forest Officers in this Presidency.

General Administrative arrangements.

280. I understand that it has been proposed to entrust the control of the Forest administration in the Presidency to a Member of the Board of Revenue, who will exercise such control, either in his own name, or in the name of the Board of Revenue. This plan may secure a healthy and vigorous development of forest conservancy, provided Government delegate sufficient powers to the officer selected.

281. As already explained it would be premature at present to propose a complete set of rules to regulate Forest administration. These must be the result of actual experience; but it may be useful now to submit a few suggestions, which I will classify under the following main heads:—

1. Business regulated by the Forest Act.
2. Financial business.
3. Personal matters.
4. Alienation of lands at the disposal of Government.

282. In the following remarks I shall have occasion repeatedly to refer to the provisions of the Forest Department Code, which regulates the business of the Forest Department in the Provinces under the Government of India, and it will make matters clearer if I mention at once, that certain chapters and sections of that Code may with advantage be adopted in the Forest Department of this Presidency, excepting those paragraphs in regard to which modifications are suggested in the present report for the Madras Presidency, and such clauses or paragraphs as

are obviously inapplicable to local circumstances. The chapters and sections, which on this understanding may be made applicable, are as follows :—

CHAPTER I.—Organization of the Forest Department.
Section i. General.
„ ii. Organization of Superior staff.
„ iii. Organization of Subordinate staff.

CHAPTER II.—Management and Working of the Forests.
Section i. General.

CHAPTER III.—Cash Accounts.
Section i. General.
„ ii. Classification of Revenue and Expenditure.
„ iii. Budget Estimates.

CHAPTER IV.—Office Business.
Section i. General.
„ ii. Divisional and Subordinate offices.
„ iii. Conservators' offices.
„ iv. Transfer of charge.

Forest business will be facilitated if the adoption of the provisions contained in these chapters, on the understanding explained above, is ordered at once.

Business regulated by the Forest Act.

283. Section 65 of the Forest Act authorizes the Governor in Council to delegate certain powers to the Board of Revenue, or to such other controlling revenue authority as the Government may appoint. These powers may all with advantage be delegated to the Member in charge of Forests. It should also be understood that all rules which Government has power to make under the Act should be framed by the Member in charge in consultation with Conservators, and be submitted by him for the sanction of Government.

During the next five years, the framing of rules under the Act will be a most important business. As stated by the Forest Committee in paragraph 27 of their report on Forest Legislation, dated the 10th June, we must carefully guard against the framing of rules to apply indiscriminately to the waste lands of the Presidency. They must be made with reference to the peculiar requirements of each district, and in many cases special rules will be required, applicable to certain hill tracts or other tracts of country. But while in making these rules the peculiar requirements of each district should receive due consideration, they must be framed on one plan, and, as there will be two Conservators, it obviously is desirable that the framing of the rules should be in the hands of a central authority, who will avail himself of the advice of Collectors and Conservators.

284. It should be made the special duty of the Member in charge to supervise the proceedings of the Forest Settlement Officers appointed under Chapter II of the Act, and thus to accelerate the work of constituting reserved forests. His attention should particularly be directed to the necessity of organizing the whole business in a methodical manner, so that the different stages of the proceedings may conveniently fit in, and that there may be no waste of time. He should make sure that the preliminary selection of the tracts proposed to be reserved is taken in hand in due time, and that, after the Forest Settlement Officer has completed his work, no time is lost in arranging for the final demarcation of the area constituted a reserved forest, and the erection of boundary marks.

Financial business.

285. As regards financial matters, it will be necessary first to clear the ground by a few remarks regarding the system of forest accounts. The peculiar feature of forest accounts in this Presidency consists in this, that all revenue due from purchasers and others is paid direct into the taluk or district treasuries. In exceptional cases only, forest revenue is collected by persons employed by the Forest

Department, but in these cases also the amount is paid direct into the local treasuries. Thus all forest revenue is accounted for at once in the general Civil accounts.

As regards expenditure, the amounts paid on account of pay and travelling allowances are, as a rule, disbursed on bills passed by the officer in charge of the Civil treasury, the Conservator's sanction being required in the case of certain travelling allowance bills. Only the outlay on working charges and contingencies is disbursed by Forest Officers, to whom funds are supplied for this purpose by letters of credit granted by the Accountant-General on the Conservator's requisition.

286. This organization greatly simplifies the system of forest accounts, and there seems no ground for making a change at present. Practically the audit of all establishment charges rests with the Accountant-General, while the working charges are audited, and the revenue accounts checked, by the Assistant in charge of the Conservator's office at Madras, acting under the Conservator's authority.

Powers of sanction.

287. What we have now to consider are the powers of sanction in respect of the annual budget grant, in respect of establishments, and in respect of special works. Within the limits of the annual grant under "Forests," it rests with the Government of Madras to make the allotment under budget heads, and to transfer allotments from one head to another. The power of making these allotments and transfers may with advantage be delegated entirely to the Member in charge, and at the outset it will probably be in every respect convenient for this officer to retain the whole business of allotment to districts and budget heads in his own hands. Under paragraph 162 of the Forest Department Code, Conservators in the Provinces under the Government of India have the power of making transfers from one district (division) to another, within the total amount sanctioned under each budget head for each circle. This power may be delegated to the Conservator, subject to the proviso suggested in paragraph 19 of the Joint Report of the 9th June, that the Conservator should not have the power to transfer any allotment from a district without the Collector's assent or the order of the Member in charge.

288. It must be remembered that the scheme under which Collectors will control the current work of the department, while the Conservators will be responsible for financial control is new, and that a good deal of care and tact will be needed in order to guard against friction. And this can best be secured if at the outset Government delegates great powers in financial matters to the Member in charge.

289. In respect of establishments, I am disposed to advocate a similar system. The appointments of the superior staff are sanctioned specifically by the Government of India; while the sanction of subordinate establishments rests entirely with the Government of Madras, as regards permanent establishments, within the monthly maximum amounts sanctioned by the Government of India, and as regards temporary establishments without such limitation. In a few cases Local Governments have delegated to Conservators the power of organizing permanent subordinate establishments, including fixing and altering the scale of their pay, but this has only been done in the case of Conservators of very great experience and ability, and under peculiar circumstances when establishments required to be newly organized, or when changes presenting difficulties in detail had become necessary. In the present case I do not advocate that this power be placed in the hands of Conservators; it should be delegated to the Member in charge of Forests, and should be exercised by him in the case of all permanent establishments. For temporary establishments I suggest that paragraph 13 of the Forest Department Code be followed. This paragraph provides for the Provinces under the Government of India, that Local Governments may give sanction to a monthly maximum amount, within the limits of which it may be left to the Conservator to make such alterations as he may from time to time find necessary in the scale of such establishments, the dates from and to which the establishments are to be entertained being distinctly specified.

290. As regards the power of sanctioning special works or other items of capital expenditure, such as the construction of roads, bridges, rest-houses, the

purchase of live-stock, stores, tools and plant, I suggest that the practice prescribed by paragraph 135 of the Forest Department Code be followed, under which Conservators have powers up to the following limits :—

		RS.	
A. Purchase of live-stock, stores, tools and plant	...	500	each item.
B. Works and other items		2,000	,,

For such outlay I suggest that the Member in charge should have power up to Rs. 10,000 for each work or item of expenditure. This is the limit granted under the Forest Department Code to the Governments of Bengal, the North-West Provinces, and the Punjab, and to the Chief Commissioner of British Burma.

291. Refunds of revenue do not often occur in the Forest Department, but in regard to these also the analogy of paragraph 143 of the Forest Department Code may be followed, and the Member in charge should have power up to Rupees 10,000, larger amounts requiring the sanction of Government.

292. After the system of accounts has been perfected, stores, tools and plant, as well as live-stock, will, if lost, destroyed, or dead, be written off under special sanction only, which sanction may, in the Provinces under the Government of India, according to paragraph 126 of the Code, be given by the Conservator, if the value of the stores, animals, or timber does not exceed Rs. 500, and I would suggest that in such cases the power, of the Member in charge should be limited to Rs. 10,000 for any one item.

293. Irrecoverable advances may, in other Provinces, under paragraph 202 of the Forest Department Code, be written off under the sanction of the Local Government, if the amount does not exceed Rs. 1,000. This power may be delegated to the Member in charge of Forests.

Audit of Accounts.

294. In paragraph 238 of this report I have suggested that an officer of standing of the superior staff should be in charge of the Conservators' offices and of the forest accounts for both circles. As regards accounts, it is for consideration whether this officer should control and audit the accounts under the orders of the Accountant-General, or whether the functions of the Accountant-General should, as at present, be limited to the audit of the establishment charges, and to the adjustment of the forest accounts with the treasury accounts of the different districts.

295. In the Provinces under the Government of India, District Forest Officers and officers in charge of Forest Divisions submit their accounts direct to the Comptroller-General at Calcutta, to whose office is attached a Forest Officer with the designation of Assistant Comptroller-General (Forests). Under the orders of the Comptroller-General, this officer deals with the forest accounts in all British Provinces directly subordinate to the Government of India.

I strongly recommend that at the outset this system be adopted in the Madras Presidency. In that case District Forest Officers will, as at present, send their accounts direct to the Central office, including those for Jungle Conservancy; the officer in charge of the Forest accounts will be subordinate to the Accountant-General in regard to this portion of his business, and the whole of the revenue and expenditure of the amalgamated Jungle Conservancy and Forest Department will be brought under the control of the Accountant-General.

296. If, on the other hand, it should be considered preferable that the audit should be departmental, then the officer in charge of the Central office should do this part of his work under the control of the Member in charge. In any case it will be necessary to arrange that the two Conservators should be kept informed month by month, at as early a date as possible, of the financial transactions of the department in the districts of their circle, so as to enable them to enforce due economy.

297. Whatever orders may be passed regarding this question, the system of accounts, and the forms used, must eventually be as much as possible assimilated to the system in the Provinces under the Government of India, which is embodied in the Forest Department Code, is the result of long experience, and has been found to work well. I do not urge any immediate changes in the system and forms of

accounts. The other changes in forest administration, which are necessitated by the Forest Act and by the introduction of a new organization, are very numerous, and it is better, for the present, not to attempt any changes in the forms of accounts. Eventually, however, a complete and logical system of accounts must be developed, and it should be made the special duty of the Member in charge to see that this is done at the right time. I am disposed to think that, when the necessity for a change arises, the best plan will be to ask the Government of India to depute the Assistant Comptroller-General (Forests) to the Madras Presidency in order to suggest the needful alterations in the system and forms of accounts. This suggestion is made on the supposition that the officer in charge of the Forest accounts at Calcutta will always be a Forest Officer with practical experience of forest business.

Free grants of Timber.

298. It will be convenient in this place to say a few words regarding the power of making free grants of timber and other forest produce. Without desiring to suggest any interference with the existing practice in those districts, where it is found to work well, I am of opinion that the general control of such free grants should be specifically vested in the Member in charge. This is a point in regard to which collisions between Collectors and Conservators may possibly occur. I am not prepared to submit any specific suggestions for modifying the rules which at present govern the grant of free passes and free grants of timber in case of fire and on other occasions, but I desire to mention that the Conservator has repeatedly drawn my attention to the present system of free grants and free passes as causing, in his opinion, needless loss of revenue and in some cases leading to abuse. What I mean to say regarding this subject is, that the Member in charge should have the power, subject to the control of Government, to modify the existing practice. The rules by which these matters are governed do not necessarily require the force of law, and need not therefore be made under the Forest Act.

Personal matters.

299. In regard to personal matters, I do not advocate any change of the existing practice. The officers of the superior staff are gazetted officers, and their postings and transfer, promotion, leave, resignation, dismissal, and other punishment, must continue to be regulated by the orders of Government, but it should be understood that ordinarily the Government will take action in accordance with the recommendations of the Member in charge. Regarding these and all other matters, Conservators should submit their suggestions, not to Government, but to the Member in charge of the Forests. In respect of the organization of the subordinate staff, the needful suggestions will be found in paragraph 275 of the present report. In accordance with these suggestions all personal matters, relating to officers of the rank of Forest-ranger and under, will rest with the Conservator and the Collector, appeals lying to the Member in charge.

Something must here be said regarding Sub-Assistant Conservators, whom it has now been decided to class as members of the subordinate staff. In other Provinces Sub-Assistant Conservators are appointed and promoted by the Local Government, and it appears to me desirable that, unless specially delegated to Conservators, these powers should be vested in the Member in charge. It will be remembered that out of the twenty-eight District-forest charges it is proposed to fill ten by placing Sub-Assistant Conservators in charge. The selection of these officers will be a matter of great importance, and at the outset it seems desirable that this part of the business should be dealt with by superior authority.

Alienation of lands at the disposal of Government.

300. In conclusion I desire to state my opinion that eventually the alienation of all unoccupied lands at the disposal of Government should be controlled by the Member in charge of Forests.

It may justly be said that the main object of forest administration in this Presidency is to secure the better utilization of these lands, and to guard against

the alienation of Government lands, where, for the public interest, it is desirable that they be not alienated.

301. I do not at present suggest any modification of the practice under which lands at the disposal of Government, whether assessed or unassessed, are alienated, beyond what has been suggested in paragraph 26 of the Forest Committee's report on the organization of forest business of the 9th June. When that report was submitted it was believed that the Forest Act would authorize the constitution of reserved lands, and prohibit their alienation by law. That provision has not been inserted in the Act, but under Section 26 (*a*) it rests with Government, by rules, which will have the force of law, to regulate or prohibit the clearing or breaking up of land for cultivation or other purposes, subject to all rights legally vested in individuals and communities, and I submit that the interests of the public will best be served if in the rules to be made under that section, the Member in charge of Forests is constituted the controlling authority in all matters relating to the alienation of such lands, as well as in matters relating to squatters and encroachments.

302. The practical object which I have in view in urging this measure upon the acceptance of Government is twofold. There are many tracts in the drier inland districts of the Peninsula where cultivation has nearly attained the limits which, in the public interest, it is desirable it should attain. In such tracts the aim towards which our efforts must be directed will be the constitution of reserved forests, whether they shall be managed by Government officers, or eventually by the villagers as village forests. But the constitution of reserved forests under the Act will necessarily be a slow process, and as a preliminary measure we must guard against the alienation of such waste lands as are likely to be hereafter required for the constitution of such reserves. By law, officers in charge of districts have the power to alienate land the property of Government, but it rests with Government to regulate the exercise of this power, and I submit that it should be made the special duty of the Member in charge of the forest business to take such measures as may in each district be necessary to guard against the alienation of such lands. Such measures should regulate the grant by competent authority of temporary leases for cultivation.

303. The second point is this: on the hill ranges of this Presidency, and, in some cases, in other localities, as in the vicinity of the coast and of canals, waste lands have a special value, and unless effective safeguards are taken, they are liable to be alienated without sufficient consideration of the consequences of such alienation. The land on the Nílgiris, on the Palnis, and other hill ranges, is a treasure and a source of future wealth in the hands of Government, which should be alienated very sparingly. The healthy development of these districts, and the settlement in them of vigorous English communities can best be promoted, if Government retains as long as possible the power of disposing of the land in the manner most advantageous to the public interests. There has already been far too much mistaken liberality in this matter, and much land has thereby been locked up, which might be utilized much better, be it as forest, as fields, or as gardens, if Government had retained control of it. At first sight the policy hitherto pursued is generous and liberal, but such apparent generosity is purchased at the expense of the future prosperity of the country.

304. It might be urged that it will be a sufficient safeguard to demarcate as speedily as possible reserved forests in these tracts, but here the work of settlement and constitution of reserved forests will be a slow, laborious and expensive business, and hence other measures besides this are required in order to guard against hasty alienation of Government lands, which has hitherto been only too common.

305. By far the most important duty of the Member in charge of Forests will, in my opinion, be, to watch jealously the operation of the rules under which waste land is alienated, be they called durkhast rules, rules under which *kowls* are given, or rules for the sale of waste lands. In these matters I submit that he should be vested, under Section 26 (*a*) of the Forest Act, with special and large powers.

PART SECOND.

CHAPTER VI.

CHINGLEPUT AND NELLORE.

306. I left Madras on the 21st November 1881, rode from the north end of the Red Hills tank to the Tandurai reserve near Avadi Railway station, and thence again north to Sholavaram. On this tour I had the company of the Tahsildar and Deputy Tahsildar of Saidápet. In the Ponnéri taluk I camped on the 21st at Sholavaram and on the 22nd at Gummidipundi. The Tahsildar of that taluk accompanied me. At the latter place the Wood-Overseer of the Nellore District met me and remained with me until I left the Nellore District. On the 23rd I reached Tadda and crossed the Pulicat lake; on the 24th I examined the Sriharikóta forests, and on the 25th went from Tadda to the reserves in the northern part of Tiruvallúr, camping at Varadayyapalayam. In company with the Tahsildar of Tiruvallúr taluk I went to the top of Kambakam hill and examined the reserved forest on this hill and at its foot, which has been strictly protected during the last 20 years. On the 26th I examined the reserves of Kadúr and Nallattúr villages in the plains. On the 28th I met the Collector of Nellore at Budanam, inspected the reserves of that village and of Kadivédu on the 29th, and the forests of Kanapuru and Sarvapalle on the 30th. On the 2nd of December the forests of Marlapudi, Cherlopalle, and Siddhavaram were examined, and on the 3rd I crossed the Vellikonda Hills by the Rápur pass to the Cuddapah District. While at Madras in December 1882, I visited the Casuarina plantations on the coast and the natural jungles in the Chingleput taluk.

The wood produced in the forests and plantations of these two districts, as far as it is not consumed locally, is all exported to the town of Madras, and on this account it is convenient to consider the forest matters of Nellore and Chingleput together. The Government forest lands in these districts are entirely under Collectors, but there is this difference that in Chingleput they are in charge of the Tahsildars of taluks, while in Nellore there is a separate officer with the designation of Wood-Overseer, who is directly under the Collector.

Climate and Vegetation.

307. The mean monthly rainfall of these two districts appears from the following figures:—

—	Ongole.	Nellore.	Madras.	Conjeeveram.	Chingleput.
January	0·29	0·53	0·98	0·69	0·49
February	0·03	0·13	0·31	0·54	0·42
March	0·14	0·31	0·44	0·19	0·20
April	0·10	0·14	0·67	0·36	0·20
May	1·49	1·44	2·33	2·31	1·88
June	1·25	1·66	1·98	2·27	2·26
July	2·54	2·32	3·80	4·18	3·12
August	3·28	3·37	4·53	6·12	4·62
September	4·41	3·12	4·80	6·38	5·38
October	6·71	9·21	10·81	6·80	6·78
November	3·52	8·87	13·12	6·88	7·84
December	0·81	3·60	4·99	2·44	3·06
Total ..	24·57	34·70	48·76	39·16	36·25

A long dry season from January until May, a scanty south-west monsoon from June until September, and a short heavy north-east monsoon from October to December are the characteristic features. A narrow moist belt, with a mean annual rainfall exceeding 40 inches, extends from the Pulicat lake southward, along the coast, through the entire Chingleput District, while inland, between the coast and the hills, the climate is much drier. North of Nellore there is an exceptionally

dry tract between the coast and the hills, comprising besides Ongole, Darsi with a mean annual fall of 19, Kanigiri with 17, and Udayagiri with 23 inches. In these northern and drier taluks the cattle known as the Nellore breed are chiefly bred.

308. It is a noteworthy fact that two trees which are common in the arid region of North-West India, *Prosopis spicigera* (jammi) and *Salvadora persica*, and which extend through the dry region of the Dekkan and the dry-inland districts of the Peninsula, are also found in the moister coast taluks of the Nellore District.

In this, as well as in the adjoining districts of South Arcot and Cuddapah, two classes of forest may be distinguished, the semi-evergreen scrub and the deciduous forest. In Nellore and Chingleput the semi-evergreen scrub occupies extensive stretches of high ground, mostly laterite, between the coast and the hills. At the foot and in the valleys of the Eastern Ghâts it assumes the character of regular forest. The open deciduous forest is found on the dry rocky ridges and slopes of the Eastern Ghâts. The remarkable forest of Sriharikôta, which consists of both evergreen and deciduous species, may be counted as a third class.

Of the semi-evergreen scrub the most characteristic species are the following, with their Telugu names, as far as I could identify them:—*Memecylon* (alli); *Flacourtia Ramontchi; Ochna squarrosa; Webera corymbosa*, Willd. (komi); *Ixora parviflora*, Vahl. (koi); *Canthium umbellatum* (nakkena) with large shining coriaceous leaves; *Canthium parviflorum* (balasu) with small yellow berries; *Randia nutans*, D.C. (manga);* *Carissa Carandas* (kallia); *Ehretia buxifolia* (pichika-bira); *Hugonia Mystax* (kaki-bira), a large rambling shrub with strong woody hooks on the branches, shining leaves, large bright yellow flowers, and red berries; *Erythroxylon monogynum*, Roxb., (dévadáru); several species of *Grewia* (tegali); *Zizyphus xylopyra* (goti), *Oenoplia; Sapindus trifoliatus*, Linn., (kankudu); *Dodonæa viscosa* (bandáru); *Glycosmis pentaphylla* (gunji); *Toddalia aculeata; Feronia Elephantum; Hemicyclia sepiaria* (manchi-bira); *Flüggea Leucopyrus* (tellapurugudu); *Maba buxifolia* (uti); *Diospyros Chloroxylon* (wulinda);† *Strychnos Nuxvomica* (musidi), *potatorum* (chilla); *Mimusops indica* (pala); *Ægle Marmelos; Protium caudatum* (konda ragi); *Vitex altissima* (nevali adugu); *Pterospermum suberifolium* (tadda). A species of *Olea* (punisi) is common at the foot of the hills and in the valleys. *Gymnosporia montana* (dante) is abundant in the semi-evergreen scrub of these districts, and it will be interesting to determine the southern limit of this shrub, which is common on the dry hills of Central India and the Dekkan. *Eugenia bracteata* is common near the coast at Madras.

Of deciduous trees in this evergreen scrub, the following may be named:—*Bauhinia racemosa* (áre); *Cassia Fistula* (rélla); *Dalbergia paniculata* (patsári); *Dichrostachys cinerea* (veluturu); *Acacia leucophlœa* (thella thumma); *Acacia Latronum* (jala); *Albizzia amara* (chikréni); *Odina Wodier* (gumpena); *Wrightia tinctoria; Spathodea falcata; Nauclea parvifolia.* At the foot of the hills a larger variety of trees is found in this description of forest, such as *Hardwickia binata* (yépi); *Anogeissus latifolia* (chiriman); *Eugenia Jambolana* and others.

309. In the open deciduous forest on the hills, the following species may be named:—*Eugenia alternifolia* (movi); *Buchanania angustifolia* (tsára); *Anogeissus latifolia; Cochlospermum Gossypium* (buruga); *Odina Wodier* (gumpena); *Chloroxylon Swietenia* (billu); *Terminalia tomentosa; Terminalia Chebula*, a marked variety, possibly a different species, with broad glabrous leaves and orange-colored petioles; *Terminalia belerica* (thándra); *Diospyros Melanoxylon* (tuki); *Lagerströmia parviflora; Boswellia thurifera; Nauclea cordifolia, parvifolia; Briedelia retusa* (salar); *Pterocarpus Marsupium; Pterocarpus santalinus* (chandanam); *Hardwickia binata* (yépi); *Cassia Fistula* (rélla); *Albizzia odoratissima* (konda-chikréni); *Shorea Tumbuggaia* (thamba); *Shorea Talura* (jalari); *Gardenia*—several species—(bikki); *Grewia vestita, tiliæfolia.* I have here classed *Odina Wodier* as deciduous. In North India

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* This shrub (manga, Tel.,), which is common in the semi-evergreen scrub of the eastern and inland districts, differs in habit from *Randia dumetorum*, Lamk., of North India and Burma. Roxburgh's description of *Posoqueria nutans* (I. 715) and Wight's figure (581) of *Randia nutans*, D.C., seem to me to refer to this species, hence the name which I have adopted provisionally, until the matter is cleared up by further research. Hooker, Fl. Ind. III, 110, refers the plant to *Randia dumetorum.*

† This shrub, with dark green ovate or ovate-lanceolate leaves, small sessile fruit and compact sessile fascicles of male flowers, which is common in the semi-evergreen scrub of the coast, and is called Wulinda in Telugu and Vakanai in Tamil, is *Diospyros Chloroxylon*, Roxb.; Cor. Pl. t. 49; Col. Beddome, Fl. Sylv. Analysis 143, identifies Vackana with *Diospyros cordifolia*, Roxb.; Cor. Pl. t. 50, which is a different species.

and Central India this tree is leafless from January to May, while at Madras, where it is planted largely as an avenue tree, it is in leaf almost throughout the year. The seasons when it sheds its leaves in different localities in South India merit careful study.

Above 2,000 feet I found on the Kambakam hill, *Actinodaphne Hookeri*, *Dillenia bracteata* (kal tek), and a species of *Cycas*.

310. The forest on the island of Sriharikóta is exceedingly varied in character: as already mentioned, it consists of trees of both classes—deciduous and evergreen—*Mimusops indica*; *Eugenia Jambolana*; *Sapindus*; *Pterospermum*; *Strychnos*, both species; *Odina*; *Memecylon*; *Diospyros Chloroxylon*; several species of *Ficus*; *Albizzia Lebbek* (dirasana); *Dalbergia paniculata*; *Cordia Myxa* (iriki); *Atalantia monophylla* (adivi nimma); and a large number of tamarind trees. There are long narrow stretches of low-lying land covered with short grass, and lined with *Pongamia glabra*. The good growth of this forest must be ascribed to the moist air on the island, which is a narrow strip of land between the sea and the Pulicat lake. The surface soil is to all appearance poor dry blown sand, but there is a stratum of moist subsoil, which causes the appearance of springs of sweet water in several places on the edge of the island. I suggest that the effect of Dykes' bund across the northern portion of the Pulicat lake, upon the Sriharikóta forest be carefully watched. Should the lake north of the bund be converted into a dry sandy plain, the forest adjoining it may deteriorate.

Casuarina Plantations.

311. Formerly the town of Madras was almost entirely supplied with wood from the natural jungles of the Chingleput and Nellore Districts and the Kalahastri Zemindari of North Arcot. During the last twenty years, however, extensive plantations of *Casuarina equisetifolia*, a tree indigenous on the coasts of Burma and the Indian Archipelago, have been made, chiefly along the coast, in the Chingleput and Nellore Districts, and now a large proportion of the firewood used in Madras is Casuarina wood grown in these plantations. In Nellore they have mostly been established by Government, but in Chingleput they are nearly all private. In order to encourage plantations of trees, Government have authorized the grant of leases, *kowls*, under which the land is held free of assessment for a period of 20 years.

312. The seedlings are either raised on the plantation or (chiefly in the vicinity of Ennore) by people who establish nurseries and make a trade of selling the plants. Plants are sold at about three rupees per thousand; they are planted out from October to January, from 6 to 12 feet apart, and watered, during the dry months, from temporary wells, the water being generally close to the surface. The watering is continued, according to the nature of the seasons, during from one to three years. The trees are sometimes cut when 5 years old, but are generally allowed to stand longer, up to 15 years. The following measurements of some of the largest trees in a private plantation near the coast, south of the Adyar river, standing 12 feet apart, with others of smaller size, will illustrate the rate of growth of this tree:—

Age.	Girth.	Height.
Years.	Inches.	Feet.
10	30	76
13	39	96
13	31	76
13	33	93
13	28	98

I have endeavoured to collect data regarding the yield and cost of planting, but the results differ so much that I must be content with giving the general conclusions, which are, that the annual yield on the coast in Chingleput varies from 2 to 6 tons per acre, and that the cost of establishing a plantation near Madras is from Rs. 25 to 50 an acre. This does not include either purchase money of the land, or assessment or superintendence. Large areas have been planted with Casuarina by ryots on assessed land in the Chingleput District, particularly along the trunk road leading to Nellore. By this road the wood is carted to Madras, a distance of more than 25 miles, which shows that Casuarina planting is a profitable business. In the

Ponnéri taluk I examined a number of such plantations on wet land, on which I was informed that assessment was paid at rates varying from 1 rupee to Rs. 3-8-0 an acre. The plantations examined by me in the Ponnéri taluk ranged in extent between 2 and 15 acres. A portion of the plantations near the coast is on dry land, assessed at only about 8 annas an acre. When cut, the trees are uprooted, and the value of the roots and stumps pays for the cutting. The wood standing sells, on the ground, at from Rs. 5 to Rs. 7 a ton, according to the distance from Madras and the facility of communications. In the vicinity of villages, the twigs, which are shed and cover the ground like the needles of coniferous trees, are gathered up and used for fuel and litter, much to the detriment of the plantation.

The Casuarina grows most luxuriantly near the coast, and here, in the private plantations between the Buckingham canal and the sea, I saw tracts where the ground was entirely covered with horizontal branches creeping along the ground, and throwing out numerous roots. Such growth has the great advantage of fixing the sand and protecting the layer of twigs which covers it. When the trees are cut and the mass of trailing branches is left on the ground, they throw up a number of leaders or vertical shoots, which reproduce the forest without expense. I have also examined the coppicing of Casuarina in the private plantations both north and south of Madras, and there is no doubt that under favorable circumstances the tree throws out shoots from the stumps, even where there were no branchlets on the stem before it was cut. These coppice shoots grow much more rapidly than seedlings; I have seen them 20 feet high when only two years old. If the result of coppicing Casuarina were more certain, this method of reproduction would probably be adopted generally in the plantations on the beach. In the drier climate inland, I doubt whether the tree can be made to throw out coppice shoots. The Casuarina is not, however, without its enemies. A species of *Cerambyx* eats the bark in long narrow bands; two kinds of borer bore into the wood; and even near the coast I found a large number of trees killed by the drought of 1882.

Fuel-supply to Madras.

313. The following statement shows the present annual import of firewood into the town of Madras. The figures have been compiled in the office of the Conservator of Forests from various data, but they can only be regarded as an uncertain approximation:—

How imported.	Quantity in Tons of 2,240 lbs.	Remarks.
1. By Madras Railway	7,562	Jungle wood.
2. By South Indian Railway ..	1,066	Said to be Casuarina.
3. By Canal — For the Nellore Firewood Depôt.	7,914	TONS. Casuarina .. .. .. 740; Other wood, Sriharikóta .. 7,174 } Total 7,914.
3. By Canal — For sale by private merchants.	40,532	Partly Casuarina.
4. By Sea	807	TONS. Casuarina .. .. 234; Other wood .. .. 573 } Total 807.
5. By Carts	6,084	Jungle wood.
Total ..	63,965	

If these figures are correct, the consumption of firewood in Madras has decreased much since 1852. On page 152 of "Forests and Gardens of South India," Dr. Cleghorn states that, "according to the published records of the late Military Board, the consumption of firewood and charcoal in Madras was estimated in 1852 at 98,652 tons per annum." Of the total quantity imported, 15,338 tons are estimated to be consumed by large factories and Government establishments, the balance, viz., 48,627 tons, representing the quantity consumed by a population of 405,848 people, which gives 268 lbs. per head a year. At the rate of 1 lb. per diem, or 365 lbs. a year, which seems more likely to be correct, allowing for the consumption of the wood grown in gardens and hedges near the town, and of dried cowdung as fuel, a population of 400,000 souls would require 65,179 tons a year.

So that adding the estimated consumption of large factories and Government establishments, 80,500 tons a year may be regarded as an approximate estimate of the present firewood consumption of Madras.

Of the wood imported into Madras, a large proportion is Casuarina, which is almost entirely the produce of private plantations. It was most fortunate that as the natural jungles, within easy reach of the town, became exhausted, private enterprize stepped in and supplied the deficiency.

314. The wood imported by the Madras Railway is chiefly brought from the jungles of the Kalahastri Zemindari and from private and Government jungles in the Chingleput District.

The wood which comes down the canal is partly brought from the Government forests of Sriharikóta, partly from the Casuarina plantations on the coast, from the Kalahastri forests, which adjoin the Chingleput District on the north side, and from the Vencatagiri Zemindari in Nellore. The wood from Kalahastri and Vencatagiri is brought on carts to Tadda, which is a large fuel depôt on the western shore of the Pulicat lake and 44 miles distant from Madras by lake and canal. Some of the wood from the Vencatagiri Zemindari is brought from a great distance, and had I not myself seen the carts on the road, laden with wood from those jungles, I should not be disposed to believe it. It is brought from jungles on high ground near Chilamanúr village, 18 miles north-west of Naydupeta, and is carted 26 miles further to Tadda before it is put into the boats. It is very remarkable that it pays to carry firewood to Madras 44 miles by cart and about the same distance by boat. Of the wood brought in on carts, much comes from extensive stretches of jungle in the Chingleput taluk. According to the official returns published in the *Gazette of India*, the mean retail price of firewood at Madras during the three years ending with 1880 was Rs. 12-7-0 per ton. Whether this figure is correct or not, the price of firewood is high, but the large and steady extension of the Casuarina plantations must eventually cause it to go down. The following figures, communicated to me by the Collector, Mr. J. F. Price, exhibit the area in the Chingleput District under cultivation with Casuarina in Fasli 1291 (1881-82) on Government land.

Taluks.	Under free *kowl*.	On *patta* land.	Total.
	ACRES.	ACRES.	ACRES.
Cingleput	1,692	334	2,026
Madrantakum	3	66	69
Conjeeveram	..	431	431
Saidápet	1,012	3,954	4,966
Tiruvallúr	..	281	281
Ponnéri	2,469	5,640	8,109
Total ..	5,176	10,706	15,882

In addition to these, large areas have been planted on Shrotriem lands, and the total area under Casuarina on Government and private land is estimated at from 25,000 to 30,000 acres, the annual yield of which, when in full bearing, ought to be at least 60,000 tons.

Jungle Conservancy in Chingleput.

315. Following the classification of the Jungle Conservancy accounts, the work done in Chingleput may be classified under *Jungles*, *Plantations*, and *Topes*. The jungles under protection are in two taluks only, their estimated area being as follows :—

	ACRES.
Tiruvallúr, in 61 villages	59,020
Saidápet, in Tandurai village	264*
Total ...	59,284

The Tandurai reserve is the only jungle in Saidápet which has been placed under conservancy, and protection here has continued during the last 11 years. A peon on

* The Collector informs me that the area is much larger than hitherto reported, probably over 1,000 acres.

Rs. 5 per mensem is in charge of this small tract, and no cutting of wood is permitted. On my visit the man informed me that cattle are not admitted, but I found evident traces of cattle having grazed in the reserve. The protection against cutting, however, which this tract has had, has been very beneficial; the evergreen scrub of which it is composed was from 6 to 10 feet high and thick in places, while the extensive waste land on the high ground in its vicinity, and between the railway and the Sholavaram tank, had all been cleared long ago, and now contained nothing but a few scattered bushes barely one foot high. The soil of Tandurai is very poor. Mr. Price tells me that some seed of margosa (*Melia indica*) and tamarind had been sown and had come up under the bushes, and thinks the reserve might be improved by planting. In that case it would be necessary to fence in the block and to keep out cattle.

In Tiruvallúr the jungles are extensive, and they include several hills on the Eastern Ghâts. Most of these jungles were rented out from 1876 to 1878 to contractors for the supply of the Madras market. Altogether 23 jungles were advertised to be rented out, with an aggregate area of 37,000 acres. In each jungle a portion, the extent of which was calculated with reference to the area under wet cultivation, was reserved for the use of the villagers for the gathering of firewood and the cutting of green branches to be used as manure. These tracts, aggregating 5,000 acres, were excluded from the leases. The whole of the jungles remained open to the villagers for grazing purposes. Only 15 of the 23 jungles advertised were, however, actually leased out, and the renters having cleared all the wood that could be felled, the leases were not renewed after 1st June 1878. In August 1880 the Collector reported, as the result of a personal examination of these jungles, that the renting out had had a most injurious effect, that some had been utterly destroyed by reckless cutting and fires, and that, wherever a jungle had been rented, almost every stick of timber above an ordinary bush had been cut down. On the other hand, the Collector reported that the effect of conservancy was visible in a most marked degree in the case of several jungles which had been conserved. He particularly instances the Puddukuppam jungle, which, with the cordial co-operation of the villagers, had been conserved for about 12 or 14 years. He adds that it was covered with the chigaru tree (*Albizzia amara*), interspersed with many young satinwood trees and shoots which had sprung up from the stools of trees cut down several years ago. The undergrowth of shrubs was dense, and the jungle was so thick as to afford cover for numerous jungle-fowl. But the neighbouring jungles which had been rented out, and were on the same soil, were bare and open.

Reserves in Tiruvallur.

316. Since 1879 the jungles in the Tiruvallúr taluk have been protected, certain tracts having been left open in each village for the use of the villagers. The following is an abstract of a statement furnished me by the Tahsildar, showing the areas placed under protection in 29 villages, and the areas left open for the use of the villagers:—

	ACRES.
Placed under protection	40,304
Left for the use of the villagers	5,929
Total area of jungles ...	46,233

The largest of the jungles thus placed under protection is Kambakam, where upwards of 11,000 acres have been preserved for 20 years. This forest, which I examined on the 25th November, is surrounded on three sides by forest lands of the Kalahastri Zemindari, which are being cut, without regard to reproduction, for the supply of firewood to Madras, the wood being carted to Tadda on the Pulicat lake. The contrast was very marked. I went to the top, where at an elevation of about 2,500 feet a rest-house has been built. The lower slopes and the valley, up which the road leads, are well stocked with dense forest, mostly occupied by evergreen species, and gradually changing into the open deciduous forest which occupies dry ridges and slopes and the plateau at the back of the hill. In the open

forest the ground is covered with high grass, which is burnt every year during the hot season. Red sanders (*Pterocarpus santalinus*), thamba and jalari, *Shorea Tumbuggaia* and *Talura* are found, but most of the trees are stunted, which I ascribe partly to the poor rocky soil (quartzite), partly to the annual fires. At the foot of the hill and in the valleys the growth of the trees is better, the forest is dense, and, if fires could be excluded, cuttings might with advantage be made.

In the plains I examined the jungles of Kadúr (1,200 acres) and Nallattur (600 acres), which had been protected for the last three years. They occupy stretches of high ground of laterite, and consist of evergreen shrubs, many of which are thorny, with a few deciduous trees. The growth is dense and some species have made good progress, standing out from the rest and promising, if protection is continued, the gradual conversion of the scrub into forest. Of the kinds which have thus taken the lead, I chiefly noticed the following:—*Webera corymbosa* (komi), *Memecylon*, *Mimusops indica;* and of deciduous trees, *Bauhinia racemosa*, *Cassia Fistula*, and *Odina Wodier*. These tracts should be visited by those who doubt the efficiency of protection on the dry red soil of the Chingleput District. If protection is continued, this scrub should gradually develope into forest similar to that which has grown up under protection at the foot of the Kambakam hill.

The jungles in the Tiruvallúr taluk are in charge of a Superintendent on Rs. 12 per mensem, with a horse allowance of Rs. 4, and eleven peons on Rs. 5 each.

Woodlands in other Taluks.

317. In the Chingleput taluk vast areas of high ground and low hills are covered with evergreen scrub, and much of the small firewood consumed in Madras is brought from these lands, small sticks, with the roots attached. I visited the tracts near Vandalúr, between Chingleput and Tiruporúr, and near Tirukalikunram. The hills which surround Chingleput, like those near Palaveram in Saidápet taluk, are very bare, *Euphorbia trigona* being in places almost the only shrub left. On some of these hills denudation has progressed so far that the soil is washed away, and the slopes are getting cut up by ravines.

Away from towns and large villages the scrub is fair, but everywhere it has been cut, hacked and grazed. Considering the large area planted with Casuarina in this district and the high yield of these plantations, it may be doubted whether the fuel supply to the town of Madras would justify any large outlay on the formation of reserves.

Nevertheless I am of opinion that reserves should be formed in the Chingleput and other taluks, in the same way as they have been formed in Tiruvallúr. And a commencement I think should be made on the low hills near Palaveram and Chingleput, as far as they are at the disposal of Government. In these places success will be difficult, because there is hardly any natural forest growth left on the ground. On the other hand, whatever wood may be produced on these hills, either naturally or by planting, will find a ready sale, and some revenue may be made at once, by selling the grass which will spring up under protection. And generally the direct advantages of reserves in the vicinity of populous places will be greater than in remote localities.

318. In addition to these hills near Palaveram and Chingleput, I wish to mention certain tracts to which the Collector has drawn my attention, and which I visited in company with Mr. Price. The most important of these tracts is a stretch of high ground, soil red loam on laterite, with low hills, on both sides of the road from Chingleput to Tiruporúr, which is included in the lands of the following villages:—

No. 128 Sempakkam.	No. 129 Settipattúr.
„ 122 Madayallúr.	„ 121 Edayankuppam.
„ 108 Illalúr.	„ 123 Kattúr.

In the evergreen scrub with which this area is stocked, there are numerous trees, partly deciduous, which, if permitted to grow up, would soon form a high forest. Of these I may mention the following species:—*Cassia Fistula*, *Pterospermum suberifolium*, *Eugenia Jambolana*, *Ficus tomentosa*. Besides these species, which are commonly found in the semi-evergreen scrub of the Chingleput District,

I found the following, and some of these in considerable numbers:—*Buchanania angustifolia* (very common), *Anogeissus latifolia* (in places abundant and gregarious), *Terminalia bellerica*, *Semecarpus Anacardium*, *Odina Wodier*, *Vitex altissima*, and *Diospyros Melanoxylon*.

The eastern end of this forest is about four miles distant from the sea, and though the soil is different, many of the species are the same as those which constitute the Sriharikóta jungles. I suggest that an area on both sides of the road be taken up, about 4 miles long, and on an average a mile wide, comprising, say, 2,500 acres. The wood produced would find a market in the surrounding villages and at Chingleput; and export to Madras would be facilitated by the vicinity of the backwater and the Buckingham canal. Eventually the forest would produce, not only fuel, but also building wood, which would give a good revenue.

The jungle on the gneiss hills near the Tirukalikunram temple has been protected for many years. There are many large sized trees on these hills, and besides the species generally found in such places, I noticed an abundance of *Albizzia amara* (chigaru, Tam.) There were also *Ehretia aspera*, *Givotia rottleriformis*, and *Strychnos potatorum*. It will probably be expedient to include some of these hills in a reserved forest.

Plantations and Topes.

319. The area of *Plantations* and *Topes* is stated in the report for 1880-81 as follows:—

Taluk.	Number.	Area in Acres.	Taluk.	Number.	Area in Acres.
Plantations.			*Topes.*		
Saidápet	1	14	Tiruvallúr	3	9
Chingleput	3	97	Saidápet	5	25
Madurantakam	2	400	Ponnéri	2	9
Conjeeveram	3	157	Chingleput	5	73
			Madurantakam	5	37
			Conjeeveram	2	24
Total ..	9	668	Total ..	22	177

The Acting Collector, in submitting his report, explains that "the terms PLANTATION and TOPE are used, not with reference to the age of the trees, but with reference to the area they cover and the purpose they are intended for. A tope covers a small area and is intended eventually for shade; a plantation covers a larger area and is started chiefly with a view to making money by selling the trees when they are fit to fell." There is a large Casuarina plantation on the banks of the Palár river in Madurantakam taluk.

Financial.

320. The following is an abstract of receipts and charges during the ten years ending 1881-82:—

Years.	Receipts.	Charges inclusive of Establishments.
	Rs.	Rs.
1872-73	5,276	2,851
1873-74	5,213	9,825
1874-75	8,290	9,563
1875-76	9,680	7,537
1876-77	7,764	6,817
1877-78	4,682	6,705
1878-79	20,205	7,390
1879-80	13,536	6,414
1880-81	3,642	7,093
1881-82	6,784	7,455
Total ..	85,072	71,650

For 1880-81 and 1881-82 the revenue comprised the following items :—

Details.	1880-81.	1881-82.
	Rs.	Rs.
Produce of Jungles worked on license or permit—timber, bamboos, firewood, grass	563	640
Produce of Plantations and Topes—timber, firewood, rent of fruit trees	2,809	3,837
Miscellaneous	270	2,307
Total ..	3,642	6,784

and the expenditure was—

Details.	1880-81.	1881-82.
	Rs.	Rs.
Jungles—sowing and planting	130	..
Plantations and Topes—planting	4,565	3,000
Establishments	2,398	4,455
Total ..	7,093	7,455

The Acting Collector explains in his report that, under the orders of the Board of Revenue, No. 74, dated the 14th January 1879, the receipts from trees on assessed land and from those in topes held on individual pattas are credited to *Land Revenue, Miscellaneous*, and that on this account the receipts during the year fell to less than one-half the amount realized in 1879-80. And in his report to the Board, of the 29th September 1880, the Collector writes as follows :—

"If we only had all the revenue derived from trees, the major part of which now goes to *Land Revenue, Miscellaneous*, we should be able to do something satisfactory. I submit that what comes from trees and their products, whether they be on poramboke or assessed waste lands, ought justly to go towards the cost of providing more trees. Large numbers of the topes of palmyras, &c., in the district which are upon the latter were no doubt put down by the villagers at the time when Jungle Conservancy was not known, and when the order of the Collector was, in such matters, the only law recognized, and I think that the village jungles ought to have the benefit of the income of these. Had the topes been planted after the Jungle Conservancy Rules came into force, the proceeds of them would have gone to swell the revenues of that fund, and I do not see why they should not now be devoted in the same direction."

It seems to be for consideration whether the orders of 1879 should not be reconsidered.

321. The area of occupied and unoccupied land in the different taluks of the Chingleput District appears from the following statement, kindly furnished to me by the Collector. The areas are stated in acres :—

Taluks.	Zemindari, Shrotriem and Inam Lands.	Government Lands.					Total Area of Taluks.
		Unoccupied.		Occupied.			
		Unassessed.	Assessed.	Wet.	Dry.	Waste.	
1	2	3	4	5	6	7	8
1. Saidapet	66,006	57,655	21,779	39,423	18,999	15,106	218,968
2. Ponneri	65,666	69,907	17,896	34,946	25,088	7,885	221,388
3. Tiruvallúr	83,400	112,028	39,676	48,377	27,316	14,746	325,543
4. Conjecveram	89,005	89,965	30,643	66,206	28,507	22,306	326,632
5. Chingleput	67,840	115,628	28,660	37,189	9,613	20,399	279,329
6. Madrantakum	157,648	114,378	50,388	57,847	33,939	31,970	446,170
Total ..	529,565	559,561	189,042	283,988	143,462	112,412	1,818,030

There is but a slight difference between the totals of this statement and the following abstract of the figures entered in Statement I appended to this report :—

	ACRES.
Zemindari and Inam land	518,670
Government land, occupied	539,862
Do. unoccupied	760,348
Total area of the district ...	1,818,880

322. It is very remarkable that 760,000 acres of unoccupied land at the disposal of Government have only yielded an average annual forest revenue of Rs. 8,500 during the last ten years, and this, though during the same period extensive woodlands were leased out and cleared of their marketable timber. The remarkably small amount of forest revenue realized in this district was explained on page 15 of the Chingleput Manual by C. S. Crole, as follows :—

"The low scrub jungle which occupies a large portion of the country, * * * * * finds a ready market as firewood in Madras, where it is carted off for sale by the ryots, who too often do not go through the formality of obtaining permission, or paying the low seigniorage of one rupee for a cart-load, which sells in Madras for about seven."

Mr. Crole in this passage refers to the old rate of seigniorage. By the Order of Government, No. 966, dated the 3rd August 1874, this rate was reduced to 6 annas for 1,000 lbs., and this lower rate is now in force in all taluks of the district. But even this rate is not paid regularly. The Collector informs me that surreptitious cutting of wood in Government jungles is still going on on a large scale. The amount realized from jungles on account of seigniorage for firewood and charcoal during the five last years has been as follows :—

	RS.
1877-78	2,200
1878-79	9,054
1879-80	1,733
1880-81	135
1881-82	98

and the Collector in his report of September 1880, already quoted, writes as follows :—

"It is true that seigniorage exists on paper, but practically no such system is enforced. It has been impossible to attempt it, for we have had neither the machinery nor the money to enable this, and until a very recent period indeed, the village officers being unpaid, have been to all intents and purposes independent of their superiors.

* * * * * * *

"The consequence has been that the jungles, excepting in the case of those * * * " placed under special protection, " have been hacked and cut about to a disgraceful extent, and that almost everything worthy of the name of a tree has, except where protected by prickly-pear, been hewn down and carried off."

Proposals for Future Management.

323. In a letter to the Board of Revenue, No. 86, dated the 27th February 1882, the Collector recommended that a member of the Forest Department should be specially deputed to form village reserves in the district, and the Board requested the Conservator to state when and at what cost he would be able to depute a competent officer for the Collector's assistance. The appointment of a competent Forest Officer, not only to form village reserves but to take charge of the entire forest business in the Chingleput District, is certainly the first measure which should be taken. This would not take the matter out of the Collector's hands. Under the organization recommended in the present report the District Forest Officer will be the Collector's assistant. His first duty will be to take the needful steps with the view of constituting the reserves already set apart in the Tiruvallúr and Saidápet taluks as reserved forests under the Act. In his letter to the Board of the 29th September 1880, the Collector admits the necessity of making a division between grazing grounds and jungle reserves. In the case of the areas placed under protection the first step towards establishing such a division has already been taken, by setting apart certain tracts for the use of the villagers, but the arrange-

ments made will have to be examined on the spot, in order to determine whether sufficient land has been assigned and in order to select good boundaries. The efficient protection and improvement of the reserves is only possible if Government has power to exclude cattle from the protected areas. In these as well as in other reserves it may be possible to permit pasture under certain conditions, on payment of reasonable fees, but sufficient grazing ground must be provided, so as to make it possible to close the reserves whenever such may be necessary. After the preliminary work has been completed, a Forest Settlement Officer must be appointed under the Act, and when the reserves have been duly constituted, it will then be the duty of the District Forest Officer to erect boundary marks, and to clear boundary lines wherever necessary. And after these areas have been demarcated their protection must be organized in an efficient manner. The Kambakam and other hill forests should certainly be protected against the inroads of fire, and in the densely stocked portion of Kambakam, at the foot and in the valleys, it will probably be possible to make cuttings and to produce revenue.

324. So far regarding the tracts already placed under protection. But there are large areas of waste land in the other parts of the district which will require attention. Regarding these, the Collector in his letter of September 1880 makes the following suggestions:—

"Now the first step which I would propose is, that in every village having a jungle poramboke, a piece of ground which should be calculated to meet the forest requirements of the present population and of its extension, should be selected and marked off as a reserve; that where there is no jungle poramboke, the plot should, if it can be spared, be taken from the grazing reserve, and where it cannot, from the assessed dry waste, of which there is, in almost all but the regular wet villages, an ample area. Where, however, a village has no available land, the reserve of the nearest village to it might be extended, so as to be sufficient for the requirements of the two.

"The work of selection and marking off could be carried out by the Revenue-officers without expense. It would take some time to perform it carefully and well.

"Having selected the reserves, I would proceed to clear them of all brushwood, shrubs, &c., covering them. These, my observation leads me to believe, are only a hindrance to other trees growing up. The sale of the brushwood would cover a good deal of the cost of clearing. Having removed all scrub, the next step would be to run all round the reserve a double ditch, with a bank in the centre, upon which aloe should be planted. The land being thus prepared should, as soon as the rains begin, be well ploughed, and, when the proper season arrived, sown with gram mixed with the seeds of such trees as *Acacia arabica; Albizzia Lebbek; Azadirachta indica* (neem); *Cassia florida; Inga dulcis*, &c. The reserve need then be left with only one watcher until the crop is ready for harvesting, when it should be pulled up, the young trees being left. In the second year it should be again ploughed and sown with gram alone. The ploughing would open the ground and thin the trees, and the gram would protect and keep them moist. After the harvest of the second year the trees could be left to take their chance, all that would be required being to, in rainy weather, still further thin by pulling out the trees where too close, and maintain a careful watch in order to prevent damage to the hedge and entry of cattle. The grass would pay all expenses and, with a good season, give a profit. The ryots would no doubt, if given the seed, which would not cost much, and allowed to take the produce without paying any assessment, gladly plough the land for nothing, and provide the watchmen. The scheme which I have now put forward is not a fancy one invented for the occasion. I tried it in the Salem District in forming topes for Government, and I have heard, since I came to this district, that it was perfectly successful and has, in some 7 or 8 years and notwithstanding the famine, produced dense jungle."

It is not, I believe, the Collector's intention to clear away the natural forest in all cases. Where the soil is favorable, and where there is a sufficient stock of natural growth, the protection of such natural growth will generally be found to be more effective and more economical, than sowing and planting. But where plantations are made, the plan described by Mr. Price may be tried as an experiment with such modifications as further experience may indicate. In selecting the seed to be sown, due regard must be had to the soil and other circumstances. Casuarina, *Pithecolobium dulce* and neem will succeed in most places in this district, but there are localities where it may be better to try other species, such as *Acacia leucophlœa, Cassia Fistula, Odina Wodier, Mimusops indica, Bassia longifolia*, and the tamarind. I would here mention the plan under which topes of mangoes and other fruit trees are raised in Northern India, which consists in this, that a well is dug in the enclosure, and that plants raised in nurseries are planted out, the ground between

the plants being cultivated with wheat or other crops until the trees are so large as to put a stop to such cultivation. This is the mode in which, in Oudh and the North-West Provinces, thousands of private topes have been planted without any expense to the landholder. The cultivators dig the well, make the ditch and embankment, which is planted up with tall grasses forming an impenetrable hedge, and in return they are permitted to cultivate the enclosed land rent free, as long as the size of the trees permits such cultivation.

These are matters of detail which will gradually settle themselves as more experience is gained. What I wish to urge is, that these experiments should not at once be commenced all over the district, but that in the first instance a few suitable areas be taken in hand, not too small, with good soil, and under otherwise favorable circumstances, one of the main points being that they must be readily accessible, so that the District Forest Officer can easily supervise the work at all seasons, and that he can be held responsible for its success. After a few plots have thus been successfully stocked with forest, and after the cost of the undertaking has been ascertained by actual experiment, operations may be extended.

325. These plantations will have to be made at the expense of Government, the tracts selected for the purpose should be constituted reserved forests under the Act, and in return for the outlay incurred by Government the produce must not be given away free, but only on payment. Later on, when the success of these undertakings is well assured, plans may be formed to let such plantations be made by the agency of the villagers. In that case they may be constituted village forests, and the produce may then, if these plantations have been made and maintained at their expense, be used by the villagers without payment. The Forest Officer might still, under the control of the Collector, exercise supervision over the management of these lands, and in that case arrangements should be made to recover from the villagers the expense of such supervision.

326. The difficulty in all this, as the Collector justly observes, is the want of revenue, and it is not easy to suggest a remedy for this difficulty.

Most of the forests in this district, which formerly yielded fuel to Madras, have been cleared out, and with the exception of some cuttings which may be made in Kambakam and perhaps in some of the other hill forests, they must have rest and efficient protection for a series of years. Some revenue may be realized from grazing fees in the reserves, but this will be a very small matter.

As already mentioned, the Collector proposes that the revenue realized from trees standing on assessed waste be credited to Jungle Conservancy, and he also proposes, in paragraph 6 of his report of the 29th September, that assessment be levied upon Casuarina plantations, and that these amounts be credited to Jungle Conservancy. Regarding the merits of these two suggestions I do not venture to offer an opinion, but it is most desirable to increase the forest revenue in this district. I can only urge the greatest attention in detail to all sources of revenue.

Hitherto, I understand, the ryots have been allowed to cut wood and bamboos, without permission, from any Government waste that suited them (Collector's No. 27, dated the 20th January 1882), and the Board of Revenue have lately (No. 733, dated the 11th March 1882) authorized the Collector to reserve bamboos, margosa (*Melia indica*), velamaram (*Acacia leucophlœa*), and several other trees. This is a move in the right direction. To give all natural produce of Government waste lands free to the ryots has, at first sight, the appearance of laudable generosity, but it deprives Government of the means of conferring permanent benefits upon the people of the district.

Jungle Conservancy, Nellore.

327. The area of the Nellore District may be sub-divided as follows :—

	ACRES.
Zemindari and Inam land	3,136,640
Government land, occupied	969,652
Do. unoccupied	1,486,668
Total area of the district ...	5,592,960

These figures are extracted from Statement I, which is based upon the latest available data. The following detailed statement has been kindly furnished by the Collector, but it will be seen that the totals in several columns do not agree with those entered in Statement I:—

Taluks.	Zemindari, Shrotriem, and Inam Lands.	Government Lands.					Total Area of Taluks.
		Unoccupied.		Occupied.			
		Unassessed.	Assessed.	Wet.	Dry.	Waste.	
1. Gudúr	208,640	181,338	37,356	43,330	62,801	2,855	536,320
2. Rápur	70,400	169,916	25,501	4,069	60,768	1,506	332,160
3. Nellore	102,400	143,520	30,972	79,550	54,654	10,024	421,120
4. Atmakur	87,680	135,457	43,377	13,687	115,641	2,238	398,080
5. Kavali	122,240	83,528	40,678	18,485	64,445	1,504	330,880
6. Udayagiri	232,960	89,833	36,118	1,756	48,113	180	408,960
7. Kandukúr	174,080	96,997	30,975	9,884	141,722	4,582	458,240
8. Kanigiri	325,760	52,043	56,705	386	45,674	72	489,640
9. Ongole	219,520	70,089	23,091	2,258	185,609	1,193	501,760
10. Venkatágiri Zemindari	842,880	..	..	..	..	..	842,880
Total ..	2,386,560	1,022,721	324,773	173,405	779,427	24,154	4,711,040

NOTE.—Several of the taluks include Zemindari villages (Venkatágiri, Kalahastri, Chundi, and Mutialapád). Those of the Venkatágiri Zemindari that are not included in any of the taluks are entered against 10.

328. The lands under Conservancy management are stated by the Board of Revenue in their Jungle Conservancy Report for 1880-81, in accordance with the Collector's report of the 22nd June 1881, to be as follows:—

Jungles.

	ACRES.
1. Worked departmentally	46,849
2. Worked on license or permit	123,279
3. Not worked at all	61,295
Total ...	231,423

Plantations and Topes.

	Number.	Area in Acres.
Plantations	80	2,641
Topes	91	238

A special report by the Collector on Jungle Conservancy of the 21st November 1879, supplemented by information locally obtained, gives the following classification. The areas are only an approximate estimate:—

	ACRES.	ACRES.
1. Sriharikóta and minor jungles		46,402
2. { Reserves within 20 miles of Nellore ...	46,862	
{ Do. 10 miles of Rámapatam ...	22,880	
		69,742
3. Unreserved jungles in the plains		91,920
4. Vellikonda, proposed reserves		23,360
Total ...		231,424

The total area, it will be noticed, is the same as that stated by the Board of Revenue.

The proposed reserves on the Vellikondas are at present on paper only. The total area of Government land on these hills amounts to 100,480 acres, all of which is under the control of the Collector for forest purposes, though the protection is not strict. In reality therefore, the area under Jungle Conservancy ought to be recorded as 308,500 acres.

Sriharikota.

329. The jungles worked departmentally are those of Sriharikóta, on the main island, as well as those on the smaller islands in the Pulicat lake. Their area is given as follows :—

	ACRES.
Sriharikóta	39,320
Minor jungles	7,082
Total ...	46,402

These, as well as the figures relating to the working of Sriharikóta, were communicated to me by the Wood Overseer, at the time of my visit.

The whole of the produce of this forest goes to Madras. The island of Sriharikóta, which separates the Pulicat lake from the sea, is 33 miles long and from half a mile to 8 miles wide. The soil is mostly blown sand, but there are patches of good soil with springs, chiefly on the edge, with the fields of 33 small villages, reduced to 8 by the Revenue Survey, the inhabitants of which graze their cattle in the forest and provide themselves with wood for their own requirements. For forest purposes the island is divided into 8 blocks, varying in extent from 3,000 to 8,000 acres. The division lines of the blocks run east and west through the entire breadth of the island; VIII is the northernmost block, and the rest from I to VII follow in regular order from north to south. Up to 1874 one block a year was rented out by public auction. This was an old established system, which existed before Jungle Conservancy was organized. In 1874 Block II having been offered for sale, the bidders combined and would advance no bid above the upset price. It was then decided, with the sanction of the Board of Revenue, to work the forest by Government Agency. A depôt was established at Madras, where the wood is sold. This depôt should be abolished, and arrangements should be made to sell the wood at Sriharikóta on the banks of the canal.

Plan of Working.

330. The blocks have been worked in the following order :—

	ACRES.		*Cuttings rented out.*	RS.
Block No. VI	3,520	1869-70		
Do. VII	4,960	1870-71	Average annual receipts ...	18,385
Do. VIII	5,260	1871-72	„ „ charges...	1,565
Do. I	5,320	1872-73	Net revenue ...	16,820
			Worked on Government Account.	
Block No. II	4,800	1874-75	Average annual receipts ...	56,464
Do. III	8,080	1876-78	„ „ charges ...	29,653
Do. IV	4,320	1879-80	Net revenue ...	26,811
Block No. V	3,060	Cuttings in progress in 1881-82.		
Total ...	39,320			

I examined Block V, where cuttings were in progress, IV with growth two years old, and III with growth four years old. The cuttings have the character of thinnings, most trees are pollarded, others are cut close to the ground.

Trees reserved from cutting.

331. Under the existing practice all tamarind trees are left standing, the consequence is that in parts there is a very large proportion of tamarind on the ground, and in such places the other trees gradually disappear. It will have to be carefully considered whether it will not suffice to let a portion of the tamarind trees stand and to pollard or coppice the rest.

Of fire I saw no trace, but cattle are numerous. Nevertheless reproduction is upon the whole very good, the shoots of *Eugenia Jambolana* being the best. I measured some in Block III, four years old, 7 inches in girth and 20 feet long.

Besides tamarind, *Pterospermum suberifolium* and *Chloroxylon Swietenia* (satinwood) are, or were formerly, spared at the cutting; they are spared for the sake of their timber. No satinwood has been cut since 1868 when Srihariköta came under Jungle Conservancy. During the renting system, the right to cut trees of *Pterospermum* above 3 feet in girth was let out once in 15 years, but since 1874 these have also been cut and sold on Government account.

Outturn and annual yield.

332. Regarding the annual yield of Srihariköta no definite data are available, but some idea may be formed from the following figures, which give the outturn of Blocks II and III. The wood is cut into billets which are classified according to girth into four sorts :—

—	Girth in Inches.	Weight of Boat-load in Tons.	Block II.		Block III.	
			Boat-loads.	Tons.	Boat-loads.	Tons.
1st Sort	5 to 9	25	31·3	782	64·8	1,620
2nd do.	3 to 5	18	111·9	2,014	193·4	3,481
3rd do.	1½ to 3	18	..	..	9·5	171
4th do.	Bundles, 3 feet 9 inches round.	12	362	4,344	630·5	7,566
Total ..	..	..	..	7,140	..	12,838

Formerly under the renting system one block a year was cut, latterly the intervals have been longer. Thus the five last blocks, VIII and I to IV, measuring 27,780 acres, have taken 8 years, and at this rate the cutting of the whole of the eight blocks, aggregating 39,320 acres, may be estimated to take 12 years. These data give the outturn and annual yield per acre as follows :—

—	Area.	Outturn.	
		Total.	Per Acre.
	ACRES.	TONS.	TONS.
Block II	4,800	7,140	1·48
„ III	8,080	12,838	1·58
Total ..	12,880	19,978	1·55

This means that under the present plan of working 1·55 tons or 3,472 lbs. on an average are taken from one acre once in 12 years, which corresponds to an annual yield per acre of 0·13 tons. This is a very small quantity, and a forest growing under such favorable conditions ought, if properly protected, to show a much larger yield.

Possible increase of Yield and Revenue.

333. If cattle could be excluded from the blocks cut over during a number of years, the growth would be more dense and the yield would be much increased. It is also for consideration, whether the larger revenue yielded by satinwood and *Pterospermum*, if sold as timber, is sufficient to justify the exclusion of these two species from the regular cuttings, and, as already explained, whether it is an advantage to spare tamarind trees to the same extent as has been done hitherto. Besides fuel and timber, the Srihariköta forests yield some revenue from minor forest produce, among which tamarind, rattans, soapnut, and chay, the root of *Hedyotis umbellata*, used as a dye, are the most important.

Since the large extension of Casuarina plantations in the Chingleput and Nellore Districts, the Srihariköta jungle has no longer the same importance which it had 25 years ago, when Dr. Cleghorn wrote the memorandum regarding it, which is printed on pages 145 to 149 of his "Forests and Gardens of Southern India." He did not then anticipate that plantations of Casuarina would prove so remunerative and that they would be so largely extended.

Still Sriharikóta furnishes a large portion of the fuel consumed in Madras. Assuming that the outturn, per acre, of the other blocks had been equal to that of Blocks II and III, the whole of the eight blocks would have yielded about 61,000 tons in 12 years or 5,100 tons a year on an average. In addition to this there is the dry or withered wood, which is cut in all blocks and exported to Madras for sale, and there is the wood cut on the smaller islands, regarding the yield of which I have no data. If it should be found profitable to grow timber on Sriharikóta, the value of these jungles would be still further increased. There is at present an import into Madras of about 500 tons of timber a year by canal, while the total annual import from all sources amounts to 17,406 tons, of which the Sriharikóta jungles may well furnish a larger share in future.

Other Jungles in the Plains.

334. Turning now to the other jungles in the plains, it will be convenient briefly to review the history of forest conservancy in this district.

Up to the year 1860, village communities had the free and unrestricted use of the jungles attached to their village areas, for pasture of their cattle and the supply of wood for their own domestic and agricultural requirements. Mr. Dykes, who was Collector at the time, feared lest the supply of wood would be insufficient, if this system of indiscriminate cutting and grazing was continued. Accordingly after some failures to raise plantations by the agency of villagers, he set apart a portion of the jungle of each village to be strictly protected. At the same time he allotted to the villagers defined tracts in their village areas to meet their requirements in the matter of grazing, fuel, and wood for agricultural implements. The aggregate area of the reserves thus demarcated amounted to 168,744 acres, which were distributed over the whole district. He also commenced plantations of palmyra and Casuarina. His successor, Mr. Boswell, maintained the reserves and extended the plantations on a large scale.

335. In 1872, when Mr. VansAgnew was Collector, complaints were made by the ryots of several villages to the effect that the extent of jungle allotted to them was insufficient for their requirements. Upon this the Collector threw open all the reserves in the district for the common use of the villagers, with the exception of the jungles surrounding Nellore within a radius of 20 miles, and those around Rámapatam in Kandukur taluk within a radius of 10 miles. The reserves retained near Nellore were 43 in number with an aggregate area of 46,862 acres, and those in the vicinity of Rámapatam were 15 in number with an aggregate area of 22,880 acres.

The existing practice under which the jungles of Sriharikóta, and the so-called minor jungles on the smaller islands, were worked and protected was not affected by these orders.

In the areas which were thrown open by Mr. VansAgnew, and which aggregate 91,920 * acres, the village communities are permitted to cut wood for *bonâ fide* domestic consumption and for agricultural implements within their village areas. They are also allowed to cut wood free for building, but the Collector's permission must be obtained.

Pasture, Kancha Lands.

336. As regards pasture, free grazing grounds have been allotted to each village up to 150 per cent. of the occupied area. In the remainder of the village jungles the grazing is let, and these are called *kancha* lands. This custom obtains chiefly in the western taluks. As an illustration I will give the distribution of lands in the areas of two villages in the Rápur taluk, which I examined on the 2nd December.

	ACRES.
* 1. Reserves near Nellore and Rámapatam	69,742
2. Minor jungles of Sriharikóta	7,082
3. Unreserved jungles in the plains	91,920
Total ..	168,744

—	Cherlopalle.	Siddhavaram.
	ACRES.	ACRES.
Occupied and unfit for grazing	1,051	566
Free grazing land	1,190	695
Kancha land	3,021	859
Total area of villages ..	5,262	2,120

In the whole taluk of Rápur about 90,000 acres are let as *kancha*, realizing Rs. 7,800 a year. The total *kancha* revenue of the district amounts to about Rs. 15,000 a year, which is credited to *Land Revenue, Miscellaneous*. It is for consideration whether this amount should not be credited to *Forests*, and this is what I recommend should be done. It might be urged that the *kancha* revenue is the rent paid for the use of the land—not the trees or jungles in it—and that rent obtained for the lease of land ought to be credited to land revenue. This objection is untenable, for grass and the leaves of the trees, on which the cattle feed, are forest produce as much as wood and timber.

In the western taluks the grazing in the *kancha* lands is generally let for periods of from 5 to 10 years, to villages near the coast where there is a great deal of wet cultivation and comparatively little grazing land. The rates vary from 1 to 3 annas per acre. The renters make ponds in these lands for their cattle. In the coast taluks assessed wet land is often allowed to lie fallow and is used for grazing. The cattle of the Nellore District are also taken to the Vellikonda hills on the western border, and across the border into the Cuddapah District. Both on the Vellikondas and in the Cuddapah District the grazing is at present free. I was informed that cutting by the villagers was not allowed in the *kancha* lands, but I came across extensive fresh cuttings in them; coppice and branches cut had been dragged to the village to make fences round compounds and gardens, which are very substantial in this part of the country.

Reserves near Nellore and Ramapatam.

337. On the 30th November I examined the reserve of Sarvapalle village, 12 miles from Nellore in the Gudúr taluk, a fine block measuring 3,200 acres. This is one of the reserves within 20 miles of Nellore, which were not thrown open by Mr. VansAgnew. The boundary separating it from the land allotted to the village for free cutting is not well defined. This and the adjoining jungles of several villages occupy a high stretch of ground on red soil, east of the trunk road. In the centre near a small tank, the growth is thick, and the shrubs and trees are about 30 feet high. The following species had made best progress in this jungle :—*Zizyphus xylopyra, Sapindus, Dalbergia paniculata, Bauhinia, Acacia Latronum, Albizzia amara, Acacia leucophlœa, Ixora parviflora, Canthium umbellatum, Mimusops indica*, and *Carissa Carandas*.

Though upon the whole the growth is good, still many shrubs had been cut, and there were marks of grazing throughout the reserve.

The reserves in the vicinity of Rámapatam north of Nellore were described to me as similar in character to that of Sarvapalle. Formerly they used to yield firewood to Madras. Since the large extension of private Casuarina plantations in Chingleput the Rámapatam jungles will probably be chiefly important in securing an abundant supply of wood to the dry taluks of Kandukur and Ongole; and for the sake of these taluks it is fortunate that Mr. VansAgnew allowed protection to continue in these tracts.

338. The construction of the anicut and other works at Sangam has lately caused a large consumption of fuel, chiefly for brick-burning, which has to a great extent been supplied by cutting thumma (*Acacia arabica*) trees growing in tank beds. I am informed that 60,000 cart-loads have already been cut for that purpose and that 100,000 more are expected to be cut. Under existing rules thumma is one of the reserved trees, and in 1877 the Collector wishing to discourage its use as ordinary firewood and to reserve it for agricultural implements, for which it is in great demand in the district, directed that a seigniorage of Rs. 2 per cart-load should be

levied. On the representation of the Engineers in charge of the works, Government in their orders of the 21st November last directed the seigniorage to be reduced to one rupee a cart-load. It is stated that the beds of tanks in the neighbourhood of Sangam are overgrown with thumma, and that they should be thinned out. This may be correct, but cuttings on so large a scale must be closely supervised by a competent Forest Officer, the cuttings must be made in accordance with a regular plan, otherwise there is risk of mischief. A thick fringe of trees at the upper edge of tanks is most beneficial, it arrests silt and to some extent diminishes evaporation. This matter demands the early attention of the Forest Officer who will be appointed to the Nellore District.

Vellikondas.

339. The eastern slopes of the Vellikonda range are half the property of the Zemindars of Venkatagiri and Kalahastri and half the property of Government.* The area of the Government forests is estimated at 157 square miles or 100,480 acres. Along this range is a belt of forest, about 10 miles wide, half in Nellore and half in Cuddapah, which is very little resorted to for timber, except in the northern part. In the valleys and at the foot of the hills, the forest is dense with a large proportion of evergreen trees, but the ridges and slopes are stocked with an open and exceedingly poor forest, in which there are very few trees of large size. The chief causes of this stunted condition of the forest are the fires of the hot season, and the lopping of the herdsmen, who pollard or cut down for fodder red sanders, *Hardwickia, Anogeissus* and other trees. At the same time the ground is exceedingly rocky, and the hard quartzite which is the chief rock forms very poor soil.

340. On these hills, certain trees have been declared reserved trees,—such as red sanders, ebony, the gallnut tree (karaka) and teak, which is only found in the northern part of the range. These at present are entirely protected. Unreserved woods may be cut on payment of seigniorage, which is higher for certain kinds, but for the majority of trees is an uniform rate of one rupee per cart-load. The export of wood from these hills into the Nellore District is very small. It is reported that during the five years from 1875 to 1879 only 719 cart-loads (or an average of 144 yearly) were exported, the seigniorage for which amounted to Rs. 952, giving an average annual revenue of Rs. 190. For bamboos the rate of seigniorage is 8 annas per cart-load, and there is a considerable quantity in these forests, both the thorny bamboo, *Bambusa arundinacea*, and the small bamboo, *Dendrocalamus strictus*. On my march across the hills I found a party of Yerikalas with small donkeys laden with bamboo trays made in these hills, used for winnowing grain brought for sale to the Nellore District. They also carried bundles of dried leaves of *Murraya Kœnigii* (karépâku), which are collected in the Cuddapah District and are used for pickle.

No revenue is at present realized from minor forest produce, though a considerable quantity of gallnuts might be collected on these hills.

341. Colonel Beddome, in his report of the 8th May 1880, printed in G.O., No. 954, of the 21st June 1881, gives a list of the trees on the Vellikondas, and reports that the Wood Overseer of the Nellore District had selected 23,360 acres on these hills in the four taluks of Rápur, Atmakur, Udayagiri and Kanigiri. These reserves however are as yet only proposals on paper. The boundaries have not been fixed, and they have not been demarcated on the ground.

I agree with Colonel Beddome in thinking that it will be useful to demarcate reserves on these hills, and to protect them against fire, in order to produce house posts of thamba, jallari and red wood, and other valuable timber for use in the Nellore District, where at present teak from Burma is used extensively even in villages for building the better class of houses. The Rajah of Venkatagiri has protected a large extent of forest at the foot of the Vellikondas, south-west of Venka-

* In the Revenue Survey Map of the Rápur taluk, scale 1 mile = 1 inch, dated December 1878, the Government land on the Vellikonda range and some of the jungles at the foot of that range, aggregating 49,106 acres, is shown as a separate block and is not included in any village area.

tagiri, and these protected areas are said to be in excellent condition, but I have not heard that any timber is exported from them.

Plantations and Topes.

342. Regarding plantations and topes, the following data were furnished me by the Wood Overseer at the time of my visit:—

	Number.	Area.	Average Number of Trees per Acre.	Cost to 31st March 1881.	
				Total.	Per Acre.
		ACRES.		RS.	RS.
Plantations of Casuarina	41	1,342	760	1,86,368	138
Plantations of Palmyra	51	1,632	799	77,233	41
Topes	65	228	37		

The total area of plantations differs a little from the figures recorded by the Board of Revenue and quoted in paragraph 328; and the data here given must therefore only be taken as approximate.

The cost of the Casuarina plantations has been exceedingly high as compared with the cost of private plantations in Chingleput. The Wood Overseer informs me that the Casuarina in this district requires watering during four years, which is longer than in Chingleput. This may perhaps be ascribed to the drier climate in Nellore. Small plantations like these, with an average area of only 32 acres, if established by Government must always be more expensive than large blocks. Some of these plantations have already been cut and the wood sold. As soon as possible a systematic examination of the Government Casuarina Plantations in this District must be made in order to determine the rate of growth of the tree and the timber production per acre. Such researches can only be made in plantations established by Government. For private plantations reliable data regarding age and history of treatment are not as a rule available.

343. In his report of the 8th May 1880 the Conservator doubts the policy of extending these plantations, and the Government in their orders of the 21st June 1881 ordered their extension to be stopped. This is a matter which demands careful consideration. It might be said that Casuarina plantations are now so established as a lucrative business that Government ought not to enter the field against private enterprize. There is certainly no need at present for Government to establish Casuarina plantations in the Chingleput District, where upwards of 30,000 acres have been planted by private enterprize within the last twenty years. The development of this industry is most satisfactory. It is a remarkable instance of large forests being created by private enterprize in India. From Madras to Coromandel, a length of 24 miles, and south of Madras from the Adyar to the Palár river, a length of 40 miles, these private Casuarina plantations form an almost continuous belt about half a mile wide along the coast. The Casuarina has fixed the sand along the coast, and large areas of waste, hitherto useless, have thus been utilized. A regular system of management has developed. The trees are cut, the stumps dug out, the ground is replanted, and attempts have been made in places, not without success, to reproduce the forest from coppice shoots. The undertaking therefore has every prospect of permanency. These plantations owe their origin to the high prices which the wood fetches at Madras. It is doubtful whether private enterprize could be depended upon to produce charcoal for reviving the iron industry in the Nellore District and for smelting the magnetic iron ores of Ongole. This can only be done if the wood is produced at less than one-fourth the price it fetches at present. Having this object in view, as well as the object of providing cheap fuel for local requirements, the establishment and maintenance of Casuarina plantations in the Nellore District seems to be a legitimate undertaking for Government.

Again on general grounds it is most desirable that the Sriharikóta forest and other existing Government forests in the Nellore District be maintained, and that they should yield as large a surplus revenue as possible, so as to pay for forest

conservancy in other less favored districts. If it should be found expedient, in order to render Sriharikóta and other Government forests in Nellore more productive, to plant Casuarina within their limits, this should not be objected to on the ground that Casuarina plantations have been successfully established by private enterprize. The first point to be aimed at must be, to increase the productiveness of these forests, and to diminish the price of wood and other forest produce; and any action of Government, calculated to attain this end, should be encouraged.

In such matters I would deprecate the indiscriminate application of general principles. Private enterprize should be encouraged in forest matters as much as in other business, but this should be done with judgment and discrimination. To continue Casuarina plantations at the extravagant outlay hitherto incurred upon them in the Nellore District would be indefensible, but to devise methods by which they can be made, maintained and reproduced at the smallest possible expenditure is a legitimate undertaking for Government. The treatment of these plantations, though simple enough, is still capable of great improvement, and it is a subject worthy of the highest skill of the forester. It has already been stated that the tree is injured by borers and other insects, and it is probable that the best remedy will be found in the mixture of other trees with Casuarina. This and other modifications in the treatment of these plantations will readily suggest themselves to the professional forester. The absence of coal in the Madras Presidency makes the production of an abundant supply of wood fuel at low prices a matter of great importance. Wood fuel is a necessity, not only for the town of Madras and other towns and villages, but also for railways, canal steamers, cotton mills, iron smelting and other undertakings. Its cost is an important item in many industries, and on general economic grounds it is most desirable to diminish its cost. The efficient management of Government forests and plantations must have the effect of increasing the production of wood and of reducing its price. And in so far as it has this effect, such management necessarily interferes with the profits made by private persons, but it does so in order to secure to the country a definite and most important economic advantage. Even at the present rate of extending these plantations, the price of wood must go down when the trees now planted are ready to be cut. As regards the town of Madras the private plantations in the Chingleput District and in the adjoining portions of Nellore and South Arcot will, unaided, bring about a steady fall in the cost of firewood. But in remote localities private enterprize can certainly not be depended upon to reduce the cost of fuel sufficiently to make it available for iron smelting and other industries. In such enterprize, where profits are uncertain, the State must often be the pioneer in India and the risk of success or failure in undertakings, which are difficult, must in India often be faced by Government. The action of Government need not, however, in such cases be continued beyond the time when financial success has been attained.

The time when Government should discontinue planting in a certain locality must be determined, not on the ground of abstract principles, but on the ground of an enquiry in detail into the circumstances of the case.

Financial.

344. The following statement exhibits the receipts and charges on account of Jungle Conservancy in Nellore during the six years ending in 1881-82 :—

Years.	Receipts.	Charges inclusive of Establishments.
	Rs.	Rs.
1876-77	46,216	77,761
1877-78	58,111	75,152
1878-79	75,453	67,005
1879-80	85,192	62,916
1880-81	67,319	60,533
1881-82	81,048	75,215
Total ..	4,13,339	4,18,582
Average ..	68,890	69,763

The details of receipts and charges during the last five years with the estimates for the current year appear from the following figures :—

Receipts.

Years.	Jungles.	Plantations.	Topes.	Miscellaneous.	Total.
Actuals.	Rs.	Rs.	Rs.	Rs.	Rs.
1877-78	53,687	..	3,998	426	58,111
1878-79	73,990	1,428	..	35	75,453
1879-80	77,444	3,487	3,819	442	85,192
1880-81	59,933	5,016	2,316	54	67,319
1881-82	76,845	2,306	1,859	38	81,048
Estimated.					
1882-83	78,400	5,000	3,000	250	86,650

Charges.

Years.	Jungles.	Plantations.	Topes.	Miscellaneous.	Total.
Actuals.	Rs.	Rs.	Rs.	Rs.	Rs.
1877-78	23,791	..	36,909	14,452	75,152
1878-79	23,543	22,947	3,799	16,716	67,005
1879-80	22,604	13,633	3,999	22,680	62,916
1880-81	20,282	15,788	4,641	19,822	60,533
1881-82	30,338	20,525	4,178	19,125	74,166 *
Estimated.					
1882-83	31,800	22,000	6,300	19,770	79,870

* The correct figure is Rs. 75,215, but the details of this total are not available.

Establishments.

345. The following is an abstract of the existing Forest establishment of the Nellore District and of its monthly cost :—

Inspecting Establishment.	Pay.	Travelling Allowance.	Total.
	Rs.	Rs.	Rs.
Wood Overseer	120	30	150
Assistant Wood Overseer ..	50	20	70
Office	41	15	56
Total ..	211	65	276
Sriharikóta and Depôt, Madras.	246	20	266
Plantations and Topes	150	40	190
Jungles	396	..	396
Total ..	792	60	852
Grand Total ..	1,003	125	1,128

The cost of this establishment is very moderate, and an increase to the Wood Overseer's pay and the Office establishment has lately been proposed by the Collector.

346. The Nellore forests are of great importance, and it has repeatedly been suggested that the whole or portions should be transferred to the Forest Department. Now that the amalgamation of Forests and Jungle Conservancy has taken effect, Nellore should, as proposed in another portion of this report, be made a first-class charge, which should be held by an officer of the superior staff—a Deputy or Assistant Conservator. The present Wood Overseer, Soma Soondra Modelly, is a good officer, who should be appointed a Sub-Assistant Conservator, but the charge is very important, and requires the services of an experienced first-class officer. This, in my opinion, is the first step required in this district.

It is my opinion that under vigorous management, the forest revenue of the Nellore District ought to increase considerably, and accordingly in my forecast a revenue of Rs. 1,00,000 has been entered. This does not include the revenue from grazing leases, which is at present credited to *Land Revenue, Miscellaneous*, but which should, like the grazing dues in the Kistna District, be credited to *Forests*. The Nellore District Forest Officer will, as hitherto, be under the Collector's orders, though in departmental, financial and professional matters the control will be in the hands of the Conservator. He should endeavour to enlist the co-operation of Tahsildars in forest matters. In the Tiruvallúr taluk of Chingleput the Tahsildar is in charge of the forests, and it should be considered how far a similar arrangement may be adopted in Nellore.

347. These however are comparatively minor points; the main object in appointing a superior officer to the charge of the Nellore forests must be to constitute reserved forests under the Act. This work, I would suggest, should be commenced in Sriharikóta and the existing reserves near Nellore and Rámapatam. When these have been put into proper order, experience will have been gained to guide further action in this direction in other parts of the district.

The officer appointed should take an early opportunity to visit the jungles of the drier northern taluks, where the formation of reserves and plantations may perhaps be found to be a necessary measure. He should carefully study the existing *kancha* lands, and the present practice of the people with regard to pasture. Some action will also have to be taken in order to demarcate and protect effectually selected tracts in the plains of the southern taluks, and on the Vellikondas.

Before action is taken in selecting reserves on the Vellikondas, I recommend that the reserved tracts in the Venkatagiri Zemindari mentioned above be carefully examined and the effect of strict protection in that part of the district be studied.

CHAPTER VII.

CUDDAPAH.

348. I entered the Cuddapah District by the Rápur pass over the Vellikondas on the 3rd December 1881, reached Chitvél on the 4th, examined the reserved forests east and west of Kódúr on the 5th and 6th, the Ballipalle forest on the 7th, the hills west of Nandalúr on the 8th, and reached Cuddapah on the 9th. The forests on the Pálkonda hills, south of Cuddapah, were visited on the 10th, the hills in the vicinity of Cuddapah on the 11th, and I left the district by train for Bellary on the 12th December. Major Campbell Walker, the Conservator, met me at Salivendra on the 3rd and remained with me until the 9th December, when he preceded me to Bellary. Unfortunately I had not time to visit the Sub-division, nor the forests in the Proddutúr and Badvél taluks, in the north-eastern part of the district.

Distribution of Forests.

349. In most parts of Cuddapah the area of waste and forest far exceeds that of the cultivated land. The following summary will illustrate this remark:—

	ACRES.
Zemindari and Inam land	772,480
Government land occupied	1,161,182
Do. do. unoccupied	3,658,658
Total area of the district ...	5,592,320

350. As regards the distribution of forest, the following may be said:—

Of the Vellikonda range, which forms the boundary between this district and Nellore, the southern portion is well wooded. From Colonel Beddome's report, and

from the information I have otherwise been able to collect, I gather that north of the Pennér river the forests on the Vellikondas have been much worked, and that in places the hills have become denuded, the chief reason being that the northern part of the Nellore District, which has a very dry climate, is comparatively bare, and that therefore the adjoining hills are largely drawn upon for wood and pasture. The southern portion of the Vellikondas, which I have traversed, is resorted to in the hot season as the grazing ground for cattle from the surrounding districts, but the demand for the wood and timber produced in its forests appears to be limited. The reason probably is that there are large areas of jungle and waste in the southern portion of the Nellore District, and that the open country of the Pullampet taluk, on the west side of the Vellikondas, is locally supplied.

351. The parallel range of the Pálkonda hills, which separates the Pullampet taluk from the table-land of the Sub-division of Cuddapah, is also well wooded, and from all I have been able to learn regarding it, is at present more important as pasture land than for the production of wood and timber. A remarkable feature of the Vellikonda and Pálkonda hills is, that they are excessively rocky and stony with scanty soil between the rocks and here and there in larger deposits in the valleys. In this respect these hills present a marked contrast to the Javádis, which are only 70 miles distant. The forest on the Vellikonda and Pálkonda hills can never be expected to be as dense and as luxuriant as the forest on the Javádis.

The most important forest tract of the district is in the upper Kódúr valley, the head of which is formed by the junction of the Vellikonda and Pálkonda ranges in the Ballipalle pass. This tract, together with the adjoining forests of the North Arcot District, forms the main source whence the Madras Railway is at present supplied with fuel. It is remarkable that the cuttings for railway fuel have not yet extended into the hills, and that the cuttings have hitherto been confined to the level ground in the valley.

But while south of Kódúr forest is abundant in the valley, the northern part of the Pullampet taluk, except the mountains on both sides of it, is without forest, and the small hill ranges in the valleys near the railway are very bare. North of the Chéyér river the hills, except the higher ranges, get more and more naked, and the lower hills of the Cuddapah and Jammalamadugu taluks are exceedingly bare.

In the north of the district there is a hill range—the Lankamalais—which runs parallel with the Vellikondas, separating the Badvél and Proddutúr taluks. Portions of this range are said to be fairly well wooded.

352. There remains the upland, comprising the four taluks of Kadiri, Ráyachóti, Madanapalle and Vayalpád, which form what is generally known as the Sub-division of Cuddapah. This upland, which may be styled the Gurramkonda plateau, is a continuation of the large plateau of Mysore, and is separated from the rest of the district by the Pálkonda range. The prevailing rock is gneiss, while the Pálkonda, Vellikonda and other hill ranges are mostly formed of slates and hard sandstones (quartzites). The higher hills of the Sub-division, which rise to 4,000 feet are well wooded, and there is a considerable extent of scattered patches of forest and brushwood.

353. The most important public documents, which give an account of the Cuddapah forests, are Colonel Beddome's excellent Inspection Reports, the dates of which are as follows :—

No. 1651,	dated the	25th January	1877—	G.O.,	1974,	dated the	13th June 1877.
„ 1393-A,	„	5th February	1878—	„	825,	„	31st May 1878.
„ 1639,	„	19th March	1879—	„	1387,	„	28th June 1879.
„ 1626,	„	29th March	1880—	„	702,	„	21st June 1880.
„ 1367,	„	28th March	1881—	„	1426,	„	28th September 1881.

A reprint of selected extracts from these reports and from Colonel Beddome's Inspection Reports of other districts would be exceedingly useful.

Character of Forests.

354. As regards their general character, the two great classes of evergreen scrub and deciduous forest are found here as elsewhere, but the area covered with

evergreen scrub is much less extensive in this than in the adjoining district of Nellore. In the upper part of the Kódúr valley there are extensive tracts at the foot of the hills stocked with evergreen scrub, but elsewhere it is limited to the bottom and sides of ravines, and on the top of the hills to moist places with good soil. From what I have seen and from Colonel Beddome's reports I gather that the principal trees and shrubs of the evergreen forest are the following :—*Diospyros Chloroxylon* (wulinda); *Maba buxifolia* (uti); *Erythroxylon monogynum* (dévadáru); *Mimusops indica* (pála); *Mimusops Elengi* (pogada); *Strychnos Nux-vomica* (musidi); *Strychnos potatorum* (chilla); *Eugenia Jambolana* (néredu); *Pterospermum suberifolium* (tadda); *Sapindus emarginatus* (kúkudu); *Memecylon* (alli); *Protium caudatum* (konda ragi), also called konda mamidi the hill mango; *Olea* (punisi); *Vitex altissima* (nevali adugu); *Hugonia Mystax* (kaki bira); *Webera corymbosa* (komi, kumbi); *Ixora parviflora* (koi); *Canthium parviflorum* (balasu); *Carissa Carandas* (kallia); *Dodonæa viscosa* (bandáru); *Murraya Königii* (karépáku), the leaves aromatic, dried, used as a condiment and exported to the Nellore District. The evergreen forest near Ballipalle comprises, besides the species named, a large variety. *Diospyros Ebenum* is found and an Euphorbiaceous shrub, *Gelonium lanceolatum* (velidaba), is one of the common species. *Pongamia glabra* (kánuga) is very common along streams on the Gurramkonda plateau, but rare in the remainder of the district. The tamarind also is common on the plateau, but it is doubtful whether it is indigenous here.

The evergreen scrub, if protected, grows into a thick compact mass, almost impenetrable, which fires do not enter. A good instance is that part of the Ballipalle reserve, which is between the railway and the foot of the hills west of the line. As far as known, the rate of growth of this class of forest is slow. In 1876, a piece in the Ballipalle reserve was cut over. On my visit I measured the average length of the shoots, and found it 9 feet, there being no marked difference between shoots from the stool and pollard shoots. A deciduous tree, *Dalbergia paniculata* (patsári), which was among the rest, had made a shoot 21 feet long. But it is not certain whether this cutting was protected from fire. The spread of this evergreen forest should be encouraged in all suitable localities, because fire-protection is easier here than in the deciduous forests; but it will be a good plan to encourage an admixture of some fast-growing deciduous trees. Experimental cuttings of a few hundred acres should, as soon as possible, be made and carefully protected, and I would suggest that narrow belts, 100 to 200 feet wide, be cut, leaving alternate belts of the forest standing; the young growth will then be protected against dry winds. It is said that *Diospyros Ebenum* yields good ebony, but except this tree and the red sanders, where it is found in this class of forest, the produce of these tracts will probably be sold as fuel.

355. The deciduous forests are mostly open, with high grass between scattered trees, which are rarely of large size. The most valuable tree is the red sanders, *Pterocarpus santalinus* (chandanam). It is gregarious and is often the dominant tree in the forest. This, to some extent, is due to the fact that the red sanders has, for some time past, been regarded as a reserved tree in this district, while the other kinds were indiscriminately cut, but mainly to its great powers of reproduction from seed and coppice, and to the fact that it is less affected by drought and the jungle fires than most other species. Hardly any large trees, however, are left; the great mass are poles under 18 inches in girth and under 30 feet in height.

In his report of the 19th March 1879, Colonel Beddome gives the following data regarding the quantity of this tree in the Rallakonda reserve, where red sanders is the chief tree. Five different plots, of one acre each, were examined, and gave the following numbers:—

1.	71	red sanders trees.
2.	129	do.
3.	131	do.
4.	180	do.
5.	72	do.
Total ...	583 or 116 per acre on an average.	

The area of this reserve is 1,565 acres. Nothing is said regarding the selection of the plots, but even on the supposition that red sanders is not evenly distributed over the entire reserve, it may be assumed that it contains over 100,000 trees, which, if fires are kept out, and if the forest is otherwise well protected, may be expected, eventually, to yield a considerable revenue.

356. As explained by Colonel Beddome, the red sanders tree has a very limited area of distribution. The Pálkonda range, from the Pápagni river to the Tirupati hills, is its chief seat. It is most abundant on the dry rocky hills south of Cuddapah, on the hills south of Gaddikóta and west of Kodúr. It is also found, but less commonly, on the Vellikonda range and on the Eastern Ghâts in the Chingleput District, north of the Madras Railway line.

It has been said above that the tree has been protected in this district. Until within the last few years, however, this protection has only been partial. In his report of February 1878, Colonel Beddome mentions that great damage had been done by the cowherds cutting down thousands of young trees to enable the cattle to feed on the leaves; and in his report of the 19th March 1879, he says that this destruction continues. As already stated all large trees were removed chiefly for house-posts, long ere conservancy commenced.

The red sanders is used in two ways: for building, and particularly for house posts, for which its great durability makes it specially valuable, and as a dye. For this latter purpose the stumps and roots of the old fellings are dug out, brought to depôts and sold. In his report of the 19th March 1879, Colonel Beddome states that from the 1st April 1868 to the 1st October 1878, Rs. 1,02,289 were realized from this source by an outlay of Rs. 25,500, which represents a net revenue of Rs. 7,000 per annum. The revenue from this source was much larger during the three years ending in 1880-81; in 1881-82 it was less, but this was due to accidental causes, the stock in hand having been sold in 1882-83.

357. Besides red sanders, and often associated with it, there are many other valuable trees in the deciduous forest of these hills, from which a considerable revenue may hereafter be expected. Of these the most important are *Shorea Talura* (jálári) and *Shorea Tumbuggaia* (thamba), much used, like red sanders, for house posts. The posts of all the better houses in the northern part of the Chingleput District are made of thamba. These trees are less abundant than red sanders, but a large number of saplings and poles are scattered through the deciduous forests. These two species are not exactly deciduous. I am told that, as in the case of sâl, the young foliage comes out about the time that the old leaves fall. Teak is not common in these forests. On the Gurramkonda plateau the tree is found here and there, and it also occurs mixed with bamboos on the Nallamalai hills in the northern part of the district.

Other valuable trees of the deciduous forest are *Chloroxylon Swietenia*, satin wood (billu), *Pterocarpus Marsupium* (yégi), *Diospyros Melanoxylon* (tukki), *Terminalia tomentosa* (nallamaddi), and *Anogeissus latifolia* (yellamma). The last-named tree is abundant in places. *Hardwickia binata* (yépi) is only found scattered here and there, and so is *Lagerströmia parviflora* (chinangi). On account of its fruit *Terminalia Chebula* (karaka), which is common in the upper part of the hill ranges, may some day prove of great importance. It is not, however, at present collected on a large scale. I found two distinct varieties or species on the hills in North Chingleput, on the Vellikondas, and on the hills near Ballipalle. One has pubescent leaves and is in every respect similar to the *Terminalia Chebula* of Northern India, the other has broad, glabrous, very coriaceous leaves on an orange-colored petiole. This is very different and may possibly prove to be a new species.

358. Of the other trees of the deciduous forest, the following may be named:— *Grewia vestita* and *tiliæfolia* (jána), *Buchanania angustifolia* (tsára), *Semecarpus Anacardium* (gudova), *Odina Wodier* (gumpena), *Elæodendron Roxburghii* (niridi), *Zizyphus xylopyra* (goti), *Sterculia urens* (pulaki), *Cochlospermum Gossypium* (kondaburuga), *Soymida febrifuga* (sumi), *Boswellia thurifera* (not common), *Cassia Fistula* (réla), *Albizzia odoratissima* and *procera*, *Dalbergia paniculata* (patsári), *Eugenia alternifolia* (movi), *Terminalia belerica* (thandra),

Schrebera swietenioides (neruvodi), *Cleistanthus collinus*, (*Lebidieropsis orbicularis*) (wodisha), *Wrightia tinctoria* (répala), *Holarrhena antidysenterica* (kolamukka), *Briedelia retusa*, *Givotia rottleriformis* (konda puliki), *Phyllanthus Emblica*, and *Bauhinia racemosa* (áre).

These are the more common trees on the hills. In the valleys and plains, and particularly in the drier parts of the district, the following species are common:—*Albizzia amara* (chikréni), *Acacia Latronum* (jala), *Acacia leucophlœa* (thella thumma), *Acacia Catechu* (sandra), *Acacia eburnea* (hundru), *Prosopis spicigera* (jammi), *Gymnosporia montana*, and *Premna tomentosa* (narvu). *Melia indica* (vépa) is grown in topes and avenues throughout the district, and it springs up self-sown in thorns and bushes of *Euphorbia* on dry hills.

In the black cotton-soil taluks (Proddutúr, Jammalamadugu and part of Cuddapah) there is a good deal of *Acacia arabica* (nalla thumma) on fields and waste lands, most useful for firewood. *Phœnix sylvestris* (ítha) is chiefly found on the Gurramkonda plateau, forming extensive stretches on low ground and along streams. This is the only palm from which toddy is drawn. Groves of palmyras have been planted along the Chéyér, Pennér and other rivers; the stems are used for building and the leaves for thatching, fans and similar purposes. The dwarf palms, *Phœnix acaulis* and *farinifera* are common in the deciduous forest on the hills.

Of bamboos, both species, the large or thorny bamboo (*Bambusa arundinacea*) and the small one (*Dendrocalamus strictus*) are found, but only here and there. The large kind is common near Ballipalle and on the Nallamalais in the northern portion of the district.

Climate.

359. As regards rainfall and moisture generally, several regions may be distinguished which also correspond to differences in the vegetation.

The upper part of the Kódúr valley above Pullampet has an annual rainfall greater than 30 inches, and here, wherever the soil is good, forest growth is luxuriant. But even in this part of the district the drought in exceptional years is very severe. There is a very dry region, comprising the greater part of the Pulivendla and Jammalamadugu taluks with a rainfall less than 20 inches. This dry region is the eastern end of the extensive dry belt which comprises a large portion of the Anantapúr and Bellary Districts. In the rest of the district the rainfall is between 20 and 30 inches, excepting a tract on the plateau in the Ráyachóti taluk under the lee of the Pálkonda range, which is very dry, with a rainfall of probably less than 20 inches. This tract is sheltered by the Pálkonda range from the north-east monsoon.

360. As regards the seasons, it may, broadly speaking, be said that there is a dry season of six months—from December to May. Storms with heavy rain often occur in May, but they are quite uncertain. The south-west monsoon (June to September) yields the largest quantity of rain, and there is also a fall in October and November, which is due to the north-east monsoon.

The following monthly means of the rainfall, in inches, at Cuddapah, based on 28 to 30 years' observations, will illustrate these remarks :—

Dry Season.	Rainfall in Inches.	Rainy Season.	Rainfall in Inches.	—
December	0·53	June	2·26	
January	0·17	July	3·62	South-west monsoon 16·38.
February	0·01	August	4·97	
March	0·37	September	5·53	
April	0·29	October	4·83	North-east monsoon 7·43.
May	1·72	November	2·60	
Total ..	3·09	Total ..	23·81	

It is remarkable that a district so near the coast and separated from it only by a mountain range of not more than 2,000 feet average elevation, gets so small a share of the north-east monsoon, whereas Nellore, for instance, has 22 out of 35 inches during the three autumn months—September, October and November.

361. Cuddapah, like other districts of the Peninsula, is exposed to extreme variations of drought and moisture. Years of heavy floods alternate with exceedingly dry seasons. The effects of the three years' drought—1875 to 1877—upon the forests are still visible. In his reports of January 1877 and February 1878, Colonel Beddome describes the destruction caused in the forests of the Pullampet Taluk by these exceptional seasons of drought. He states that *Anogeissus latifolia* had suffered most, vast numbers of small trees (6 to 12 years of age) having been killed. Evergreen trees also, particularly *Strychnos Nux-vomica* and *Memecylon tinctorium*, died in large numbers.

On my tour, I saw numerous dead trees of different kinds still standing on the hills near Kódúr. In other parts of the district, dry trees killed during the famine are not commonly seen, possibly because the dry wood has since been cut and removed for fuel. Colonel Beddome gives a list of trees in topes, killed during the famine, comprising 7,027 palmyra trees in one place, and numerous mango and tamarind trees in others. In February 1878, Mr. Price, the Collector, in forwarding Colonel Beddome's report, stated that there was hardly a tope in the district which had not suffered severely from the drought.

362. These data give evidence of the disastrous effect of the period of drought, which has caused the population of the district to decrease from 1,351,200 souls in 1871 to 1,121,000 souls in 1881. The years of heavy floods have also been most destructive, but the damage done by floods is of a different kind. The following extract from the Cuddapah Manual, by J. D. B. Gribble (page 198), speaks for itself:—

"One year drought, and the next or soon afterwards so heavy a downpour that tanks are bursting on all sides. One of Munro's earliest difficulties (1803) was the bursting of a large number of tanks following on three years of drought. It would be tedious to narrate the details of all such outbursts, and I will only notice a few of the principal ones. In 1818, 180 tanks burst in the Gurramkonda (now Voilpaud) taluk alone owing to a heavy burst of the south-west monsoon in May. In 1820, on the 8th and 9th May, there was another violent storm, and 777 tanks burst in the same taluk of Gurramkonda.

"In Royachoty taluk 125 tanks burst, and from Chitwail the loss of 20 lives and a large number of cattle is reported. In 1851 there was considerable loss of life and property in the same month. The village of Chowtapally, in the Jammalamadugu taluk, was swept away by the confluence of the Pennair and the Chitravati, and 500 lives are reported to have been lost. In the same storm, in Pulivendla taluk, the village of Parnapally was partially destroyed, and 142 houses were carried away; 68 corpses were washed on shore and many other lives are supposed to have been lost. 'The rain commenced on the evening of the 5th, continued very heavily during the night and following day, and on the evening of the 6th, such torrents came down the rivers that the villages were swept away without allowing the inhabitants time to fly; other villages are also spoken of as being swept away, but details are not given.' (Mr. Murray to Government, 20th May 1851.) In the following year (October) the Booga and Ralah Vankah came down in such floods that for some days communication between the town of Cuddapah and the cantonments was stopped. The town was flooded, and there was great loss of house property and goods; 'bales of cloth are still soaking in the muddy waters of the river.' In 1872, on the 2nd of May, the cyclone, which was so disastrous in Madras, broke with great violence upon this district, but only a few tanks were breached. In 1874 a cyclone again swept over this district and on almost the same day (5th, 6th May). Fortunately the tanks were mostly empty, and but few losses occurred. The most dangerous month for rain is May, and the more dangerous because the monsoon so seldom breaks heavily over this district. For six or seven years there will be only drizzling showers, but then a violent downpour of rain occurs when no one is prepared.'"

363. We cannot expect by any measure of forest conservancy to modify these extreme variations of climate. If the whole district, or the greater portion of it, could be clothed with dense forest, it is not impossible that the climate might be more equable. But nothing of the kind is proposed or can be attempted. Of the 5,600,000 acres, which is the area of the district, 2,000,000 are occupied, and the greater portion of this area is cultivated. Of the remainder a considerable portion must remain open for pasture, and the outside area which we can at present expect permanently to maintain as forest may be put down as 500,000 acres or less than one-tenth part of the district. The expense of demarcating and protecting this area will be far greater than the revenue which these forests may be expected to furnish. This area, if really converted into dense forest, will be most beneficial to the country apart from its yield of timber, wood, and other forest produce; but, as far as our

knowledge extends at present, we cannot expect that it will have any material influence upon the climate. But forest conservancy can certainly be expected to mitigate the effects of drought, and to diminish the violence of floods by retarding the surface drainage.

Objects of Forest Conservancy in Cuddapah.

364. The chief objects of forest conservancy in the Cuddapah District are the provision of a continued supply of fuel for a section of the Madras Railway, the production of timber for export, of timber, bamboos, fuel, and cattle fodder for the people of the district, and the regulation of the water-supply. The forests of the Pullampet taluk furnish a large proportion of the fuel consumed by the Madras Railway. In 1881 the quantity was 8,860 tons from Government and 1,800 tons from private forests; and, according to Colonel Beddome's reports, the following are the quantities delivered from Government forests and the revenue realized therefrom during the last twelve years :—

Years.	Tons.	Net Revenue.	Remarks.
		Rs.	
1870-71	8,000	18,000	Report dated the 25th January 1877.
1871-72	10,000	23,000	
1872-73	16,000	37,000	
1873-74	17,000	39,000	
1874-75	13,000	29,000	
1875-76	13,000	28,000	
1876-77	16,000	33,000	Report dated the 19th March 1879.
1877-78	22,000	50,000	
1878-79	12,000	28,000	Annual reports.
1879-80	5,000	12,000	
1880-81	7,000	16,000	
1881-82	11,000	26,000	
Total ..	150,000	3,39,000	

The supply from private lands in this and the adjoining districts must gradually diminish, and considering the extent and condition of the Government forests available for the supply in the other districts through which this railway runs, it may be regarded as certain that the Cuddapah forests will, within the next fifty years, have to furnish a large portion of the annual supply.

Next in importance to the production of fuel for the railway is the maintenance of a permanent supply of charcoal for iron smelting. As far as my information goes iron is, or was formerly, made in small native furnaces in four localities. On the Gurramkonda plateau iron was formerly made near the Mysore frontier, and near the Pálkonda range in the Váyalpád taluk. On the east side of the Pálkonda range in Pullampet taluk iron is made at Yerraguntlacótah. And the stretch of iron-smelting villages on the west side of the Nallamalais in Kurnool extends southward into the Proddutur taluk in Cuddapah, the ore being brought from the Lankamalais. In the selection of reserves the requirements of the existing native iron industry should be most carefully considered.

The timbers demanded by the trade are: red sanders, thamba and some other kinds which are found chiefly in the deciduous forest on the hills. No estimate is possible of the quantity required, but so much may be assumed as certain that the forests which contain these timbers and which it may be possible to reserve will not produce more than can be utilized.

365. Besides the ordinary requirements of the people, in the matter of wood for building, for agricultural and domestic purposes, and of fuel, grass and pasture, which the forests and waste lands supply, there is in this and other districts a special demand for leaves and branches for the manure of rice fields. When the fields have been ploughed and thoroughly soaked with water, green twigs and leaves are spread over the ground. The leaves of some plants are first dried before they are put upon the fields. Twigs and leaves are then trodden in and covered, and shortly afterwards the paddy is sown. The larger branches do not rot, and after the paddy has been cut, and the ground is again ploughed, they are taken out and used as fuel,

366. The leaves of several large herbs and undershrubs are used for this purpose, such as *Calotropis gigantea; Cassia auriculata*, (thangédu). Of trees and shrubs it may be said that most thornless kinds are used, and the following may be specially named as important in this respect:—*Melia indica*, (vépa); *Poinciana elata*, (sankésvaram); *Albizzia Lebbek*, (dirasana); *Dodonœa viscosa*, (bandáru); *Pongamia glabra*, (kánuga); *Dalbergia paniculata*, (patsari).

367. The protection and improvement of the reserved forests will make it possible to make available for the villages in the vicinity of these forests ample supplies of branches and leaves for manure. Indeed it will tend to improve the condition of some of the forests if the consumption of leaves and branches of the less valuable kinds is encouraged. In most of these forests there will be certain kinds, the produce of which has a special market value, such as teak, thamba, red sanders, yépi, yégi. In order to promote the growth of these trees, it is desirable to permit the lopping of branches or the cutting of the less valuable kinds for fuel, manure, fencing, cattle-fodder, litter, or for other purposes. In this manner the strict protection and consequent improvement of the reserves will benefit the villages in their vicinity. The lopping for cattle-fodder of red sanders and other specially valuable species could not of course as a rule be permitted in the reserves, but there are many other kinds the leaves of which are eaten by cattle.

368. As regards cattle-fodder the Conservator has already introduced a system of tickets, by which grass can be removed on payment, and in their orders of the 4th August 1881, the Board of Revenue have commended this system, which supplies the people with forage at a cheap rate, and have expressed their opinion that the plan might be advantageously adopted in all districts. Experience will show that here in Cuddapah, as in Northern India, where waste land has for some time been efficiently protected, an abundant crop of grass will spring up. Besides this there are several kinds of trees the leaves of which are most useful as cattle-fodder and the growth of which should be encouraged, particularly in those reserves which are in the vicinity of the open cultivated country. The chief of these is *Prosopis spicigera* (jammi), which, as Colonel Beddome reports, grows remarkably well in the plantations in the open country. The pods of the babul (*Acacia arabica*) are also an excellent cattle-fodder, and this tree might be grown largely in those taluks where black soil is found.

The Forest Officers of the Cuddapah District should study the cultivation of these trees in the reserves which will be formed in the open portion of the district. Well stocked tracts of these will be of great value in times of drought and scarcity, to assist in keeping alive the cattle of the surrounding country. These are the chief objects which forest conservancy in the Cuddapah District can attain, as far as a more abundant and permanent provision of forest produce is concerned.

369. But the protection of forests will also have a beneficial effect in regulating the surface drainage and thereby increasing the supply of water for irrigation. Of the culturable area in the district (Government and Inam), it is estimated that 330,600 acres are irrigable, as follows:—

	ACRES.
From Tanks	165,000
„ Wells	120,000
„ River Channels	28,000
„ Spring do.	17,000
„ Anicuts	600
Total ...	330,600

The river channels are taken off in river beds, either from running water or from water in the sand, and they are fed chiefly by the Cheyér, Pápagni and Pennér rivers. Spring channels are dug in stretches of low lying alluvial soil, generally in the vicinity of rivers.

These sources of irrigation are local and are almost entirely due to the rain which falls in the district. The only notable exceptions are:—The river channels drawn from the Pennér. The Kandakúr tank (irrigated area 1,627 acres) which is entirely fed by the head of the Pápagni river from Mysore. The Sagilér river also

rises outside the district in the Nallamalai and Vellikonda hills of Kurnool, and some large tanks in its basin are fed by tributary streams which partly rise beyond the limits of the district. In addition to the areas stated above, a small area, probably 7,000 to 8,000 acres, is irrigated from the Kurnool-Cuddapah canal, which gets its chief water-supply from the Tungabhadra river.

370. The tanks begin to fill late in the season, in July or August, and sometimes not until the north-east monsoon has commenced, and they generally dry up in March. Deep and built-up wells generally retain water throughout the year, but are often low during the hot season, from April to June. The river and spring channels may in ordinary years be made to yield water for irrigation throughout the year except at the end of the hot season by clearing out the channel.

There is little doubt that if it were possible to get the whole of the hills in the district stocked with dense scrub or forest, the water-supply in the tanks, wells and channels would be much improved. To what extent the demarcation and protection of reserves, to the extent proposed in the present report, would be beneficial in this respect, it is impossible to say. But in the selection of the reserves the aim should always be to place under protection as large a proportion as possible of the catchment areas upon which the water-supply to streams, tanks and wells depends.

371. The protection of the hill forests in this district will probably have the effect of improving the water-supply in the Pennér river for irrigation in the Nellore District. From the diagrams showing the height of the river at the Nellore anicut from 1869 to 1881, it appears that from August to December, the Pennér at that place contains sufficient water for the irrigation fed by the channels taken off above the anicut. The chief feeders of this river, the Sagilér, the Cheyér and the Pápagni, have nearly the whole of their catchment area in this district, and these rivers probably contribute a large portion of the Pennér water-supply in Nellore. It is needless here to say more on this subject, but in framing plans for the demarcation and protection of reserves, it should be borne in mind that the beneficial effect of their improvement will not be limited to the supply of timber and railway fuel, but will probably confer benefits of a more important character upon the cultivating classes of the Cuddapah and Nellore Districts.

Reserved Forests.

372. The most important measure whereby the different objects set forth in the preceding paragraphs can be attained is the formation of well-selected reserved forests, and the efficient protection and steady improvement of these forests. Here, as in most other districts, these reserves will be of two classes—large areas on the hills and in the wilder tracts, and smaller blocks in the open country. I shall not attempt to submit any proposals regarding the total area of these reserves, nor shall I make any suggestions regarding the size of the blocks. The present report will merely indicate what has already been accomplished in this respect, and in which direction, and in what manner the work should be continued. It stands to reason, and requires no proof that in a hilly and wild country none but large-sized areas can conveniently be watched and managed, whereas in the plains and in the open country where communication is easy, arrangements can be made for protecting and managing blocks of smaller size.

373. It might be thought that we ought to establish four different classes of reserves for the production of timber, of railway fuel, of wood and grass for village requirements, and for the improvement of the water-supply. Such an arrangement would be impracticable, and I shall not propose it. All lands taken in hand for purposes of forest conservancy, whether reserves or plantations, require similar treatment, and the same areas will, according to circumstances, yield timber for export, railway fuel, small wood, fuel and pasture for villages, and they will also be useful for regulating the water-supply in wells, tanks and rivers.

Fuel-supply to Railway.

374. It will be convenient in the first instance to consider what has been done and what remains to be done in the matter of demarcation, protection and manage-

ment of the reserves formed in the vicinity of the railway and mainly with the object of producing fuel for the service of the line.

The following reserves and plantations have been sanctioned, demarcated on the ground and fenced with stone walls wherever such was considered necessary. With the exception of the Camalapúr plantation, they are all situated in the Pullampet taluk.

Name.	Date of formation.	Area in Acres.	Remarks.
Reserves east of the Railway.			
1. Kodúr hill	1871–74	4,687	On the west slopes of the Vellikondas, east of Kodúr, highest point 1,896 feet.
2. Ballipalle, II	1871	4,484	On the lower slopes of the Vellikondas, highest point 1,371 feet, level ground on west and south sides.
Reserves west of the Railway.			
3. Ballipalle, I	1867	6,307	Stretches of level ground between the railway and the hills, and in a valley, the rest rocky and stony on the eastern slopes of the Pálkondas, highest point 2,142 feet.
4. Vacaticónah	1874	3,595	Eastern slope of the Pálkondas, highest point 1,888 feet.
5. Thanakonda	1874	1,048	An isolated hill two miles west of Kodúr Railway-station, well protected, and the forest growth much improved, highest point 1,650 feet.
6. Yerraguntlakótah	1873	3,487	Northern and eastern part flat, but very stony, highest point 1,933 feet.
7. Rallakonda	1879	1,565	Rocky hills, rich in red sanders, highest point 2,223 feet.
8. Gathala	1874	9,682	West of Yerraguntlakótah, partly in the valley of the Pulangi river, highest point 2,111 feet.
9. Rollamadugu	..	5,424	On the hills south-east of the Cheyér river, three miles south of the Rajampet-Ráyachóti road, highest point 1,438 feet. Chiefly red sanders.
	Total ..	40,279	
Plantations near the Railway.			
	Commenced		
10. Ooperapalle	1868-69	108	6 miles south-east of Kodúr.
11. Kodúr	1865	50	20 acres stocked with Red Sanders.
12. Reddipalle	1869-70	924	12 miles north-west of Kodúr.
13. Pullampet	1871	328	14½ miles north-west of Kodúr.
14. Camalapúr	1869	263	On the banks of the Pápagni river.
	Total ..	1,673	
	Area of Reserves ..	40,279	
	Grand Total ..	41,952	

375. Altogether 42,000 acres have been sanctioned and finally demarcated, and we have now to consider whether any further extension of the reserved area is needed. In 1877, Colonel Beddome said that he did not propose any extension in this portion of the district, and he added that these reserves should be gradually worked up to an outturn of at least 30 tons per acre every 12 or 15 years, which he felt certain they could easily do if properly enclosed and rendered safe from fire. In a previous chapter of this report it has been explained that the data available justify the assumption that the Cuddapah reserves in their present condition will produce a mean annual yield at the rate of one quarter ton per acre, or say about 10,000 tons of wood fit to be used as railway fuel. It has also been explained that a considerable extension of the area must be made in this district in order to ensure a larger supply of wood for railway fuel. No limit of area need be fixed, and it will suffice to say that all suitable land at the disposal of Government, which can be made available, and from which fuel can be brought to the line at reasonable rates, must be taken up. It will be understood that the entire yield of this area will not be available as railway fuel, for the wood of the more valuable kinds will command much higher prices if sold as timber, and it would be waste to sell such wood as fuel. Again, as Colonel Beddome explains, the carriage of fuel from certain tracts on the hills would be too expensive to be remunerative.

376. The first task, therefore, which should be taken in hand in this district in the matter of extending the reserved forests is, to select as large an area as possible, primarily with the view of supplying fuel for the railway. An attempt should be made to include as much of the waste land as possible between the hills and the railway line in the Pullampet taluk. There are large areas in the upper part of the Kódúr valley, formerly stocked with forest, which have been cleared for railway fuel, and which fires and cattle have not permitted to grow up again. Instances are: the tract between Thanakonda and Yerraguntlakótah and the valley between the last-named reserve and Rallakonda. Such tracts should be included, as far as such can be done without interfering with the requirements of the villages in the vicinity. Wherever possible, tracts of waste land in the immediate vicinity of the line should be included. Among others, I would mention a large area of waste land south of the Reddipalle tank and adjoining the Reddipalle plantation. In such cases it will probably pay to plant.

377. The areas taken up as plantations will furnish a fair yield, though the planting has not everywhere been successful. The most successful of these is the small red sanders plantation near Kódúr, which was formed in 1866. When I examined it in December 1881, I estimated that the best stocked portion contained about 2,400 cubic feet of wood per acre including twigs and branches, corresponding to an annual yield of 150 cubic feet per acre. A cubic foot of the heart-wood of red sanders weighs 76 lbs., but at present the trees in the plantation consist mostly of sap-wood, and up to this time the yield of this portion of the plantation may be put down at 3 tons per acre per annum. Red sanders of course will be more profitably sold for timber, but it is not impossible that in this locality other trees may furnish a similar yield. This is the yield of a carefully tended plantation, which was watered for several years, on good soil, and in the comparatively moist climate of Kódúr. In the drier parts of the district, for instance at Camalapúr, the yield will be much less. But it is not impossible that, eventually, with the aid of planting, the reserves in the plains of the Cuddapah District, including the evergreen scrub at the foot of the hills, will produce an average annual yield of one ton per acre, while on the hills it may perhaps be possible to improve the forest up to an average yield of half a ton per acre per annum. As regards red sanders, it will always be more profitable to sell the main produce as timber. Colonel Beddome in his report of January 1877 says that posts of heart-wood of red sanders, 7 feet long and 22 inches in girth, find a ready sale at from Rs. 10 to Rs. 15 each, and in a later report he states that trees at the Kódúr plantation, 12 years old, had formed heart-wood. It may safely be assumed that when 40 years old, these trees at Kódúr will be worth Rs. 10 a piece, which at the rate of 200 trees will represent a value of Rs. 2,000 per acre. This is much more than could ever be realized by selling the wood as fuel.

378. The low range of hills east of the line, which separates the Pullampet valley from that of Chitvél, is exceedingly bare, and in its present state is probably of very little use as grazing ground during the greater part of the year. These hills should be examined, and suitable areas enclosed by way of experiment, in the same manner as has been done with much success on the bare hills of the Ajmere District in Rajputana. The first benefit which will be derived from enclosing and protecting such areas will be that they will produce an abundant crop of grass, which may be made available as cattle-fodder by allowing it to be cut.

379. It stands to reason that where good roads, such as that from Pullampet to Chitvél, and from Rajampet to Ráyachóti are available, it will be possible to select reserves for the fuel-supply of the railway at a greater distance from the line than is advisable elsewhere. The hills on both sides of these roads should therefore be examined. I would further suggest that a reserve be formed on the hills west of Nandalúr, which are traversed by the line between that station and Wontimetta. These hills contain more scrub and trees on the top, including red sanders, than those between Pullampet and Chitvél, and if protection is continued sufficiently long, they will not only yield a larger supply of grass to the surrounding villages, but will also eventually furnish fuel for the railway.

Proceeding north, the hills in the vicinity of the line are much more bare and arid than in the Pullampet taluk. The reserves which, for other reasons, should be formed on the hills which surround the Cuddapah valley, and which are between Cuddapah and Wontimetta, will probably be more important to supply local requirements than for the supply of railway fuel. For the supply of the railway, it may however be possible to obtain some blocks of waste land near the Pápagni river, contiguous and opposite to the Camalapúr plantation. I may here mention that though the four plantations which have been made near the line have been expensive, and have been pronounced a failure, they should not be given up. Certain indigenous species, such as *Acacia leucophlœa* and *Prosopis spicigera*, have been found to thrive well. The areas should continue to be strictly protected, and hereafter it may be found possible to plant such indigenous trees at a much less cost than has hitherto been done. The cultivation of trees which coppice freely should be encouraged, and on this account I would recommend that special attention be paid, at first by way of experiment, to the cultivation of *Zizyphus Jujuba*. The outlay incurred on these plantations without corresponding return has been urged as a reason for abandoning them, but experiments are necessarily expensive, and time must be allowed for experience to be gained. If it should be possible to include patches of black soil within these reserves, *Acacia arabica* should be grown in such places.

It is for consideration whether reserves for the supply of railway fuel on the Nallamalais and Lankamalais should not be formed in the vicinity of the Kurnool-Cuddapah canal.

Demarcation of Reserves on the Palkonda, Vellikonda and other Hill Ranges.

380. This closes the suggestions which I have to submit regarding the formation of reserves with the primary object of supplying fuel to the railway. Some of these areas will, as already explained, be useful as producing timber for export, and forest produce for the open country in their vicinity. It will now be well to review the proposals which have been made for the formation of reserves (Forests and Jungle Conservancy) in other parts of the district. On the Pálkonda range the following reserves have been proposed by the local Forest Officer and the Divisional Civil Officer, and have been approved by Government. The boundaries however have not been fixed in detail and not been demarcated on the ground:—

First.—Mudampád, comprising the crest of the range between the Pulangi and Cheyér rivers, estimated at 14 square miles. This should, if possible, be united with Gathala and Rollamadugu reserves which would then form a fine compact block on the hills between the two rivers named.

Second.—Gadikóta reserve, on the hills between the Mandavéru river and the Sanipaya ghát road, estimated at 7 square miles, comprising the plateau on the top of the Pálkonda range, reported to be well stocked with red sanders.

Third.—Wongimalla reserve (called Guvalacheruvu in the records), estimated at 33 square miles, might be extended so as to comprise the greater part of the head-waters of the Bugga and its chief feeders. It has been proposed to divide this area into two blocks, so as to exclude a stream which runs through the middle of it, in order to give the cattle grazing outside the reserve access to the water in the hot weather. There is no necessity, however, for this purpose to cut up the reserve, as a path to the water may be left open for the cattle without interfering with the protection of the reserve.

Fourth.—Guvalacheruvu reserve, comprising that portion of the Pálkonda range in the Cuddapah taluk which is west of the Guvalacheruvu ghát, and estimated at 23 square miles. The boundary of this reserve should be extended on the south into the Ráyachóti taluk to the edge of the plateau, where a line of cliffs would form an excellent boundary; and it may also be extended eastward so as to join on to the Wongimalla block. If this is done a portion of the jungles from which the town of

Cuddapah is at present supplied with firewood would be included, but this is no disadvantage. It is not intended to close all portions of the reserve absolutely; indeed, it is very desirable that certain portions should be worked. The price of firewood at Cuddapah is reported to be only Rs. 5-9-0 per ton, which is remarkably low. It is at present brought from the hills to the south, an average distance of 15 miles, mostly on bullocks. The population is 18,000. A great deal of dried cow-dung (bratties) is probably burnt in the town.

381. If these suggestions are accepted, the combined Guvalacheruvu and Wongimalla reserves will protect a large portion of the catchment area (estimated at 180 square miles) drained by the Bugga and its feeders; and if this reserve on the hills south of Cuddapah is efficiently protected, so as to cause the forest to become dense, the water-supply to the tanks and wells near Cuddapah and the supply of drinking water for the town will be thereby assured.

It is probable that the extent of land irrigated from the tanks, channels, and wells which derive their water-supply from the drainage area of the Bugga and its feeders is not less than 4,000 acres, producing an annual revenue of Rs. 30,000 to Rs. 40,000. The soil in the valley of the Bugga above and below Cuddapah is rich, and owing to the high prices obtained for produce in the town and the ready supply of manure which it affords, the cultivation of the land is brought to greater perfection here than elsewhere in the district. To this result the constant presence of water, both in the pools along the bed of the Bugga, the flow from which supplies the channels, and in the wells with which the valley abounds, has largely contributed. A project has been set on foot for supplying Cuddapah with drinking water from springs in the Bugga some three miles above the town. The scheme, if carried out, will, I am informed, cost about 70,000 rupees, and is expected to be of great benefit in improving the health of the inhabitants. For the success of this scheme it is essential that there should be a continuous flow of water in the springs during the dry season. At present there is such a flow, though the supply is scanty during the hot season, and it is probable that the continuous supply is to some extent due to the presence of forest upon the catchment area whence the springs are fed. It seems to me to be very important to protect this forest and gradually to improve it, chiefly by means of fire-protection, and thereby, if possible, to increase the water-supply available for the town of Cuddapah and its vicinity. This will be effected if the reserves here proposed are constituted and efficiently protected.

382. On the Vellikondas, a block estimated at 12 square miles, south of the Rápur pass, and proposed to be called the Sullavendra reserve, has been approved by Government. This area is not conveniently situated either for the supply of the railway or for the export of timber, and though eventually reserves will doubtless have to be formed on the Vellikondas south of the Pennér river, the work does not press and may be deferred until the other reserves have been demarcated and put into proper order.

As far as I have been able to conclude from personal observation and from the information collected on my tour, the demand for wood from the Vellikonda range between the Kódúr hill reserve and the Pennér is not considerable. These hills are chiefly used as the hot-weather grazing grounds for the cattle of the Nellore District, and it is for consideration whether it will not suffice as a preliminary measure to prohibit the alienation of any land on this portion of the Vellikonda range.

383. On the Vellikonda range, north of the Pennér river, a reserve at Mulliamkonda had been proposed, but was rejected because the land was used as grazing ground and included a temple and a sacred hill, for a road to which arrangements might have been made. From Colonel Beddome's reports I gather that this portion of the range is much more denuded than that south of the river, and the question of doing something for the protection of the hills here is a matter which should not be lost sight of; indeed, Government have already in their Order, No. 1832, of the 29th November 1881, directed the Collector to select another reserve in the Siddhavattam taluk.

384. A reserve called Nainapalle has been proposed and approved by Government in the Badvél Taluk on the Nallamalais on the northern boundary of the district, estimated at 24 square miles. This reserve will nearly join on to the southernmost of the Nallamalai reserves in the Kurnool District.

So far regarding the reserves which have been proposed by the Forest Department and approved by Government.

385. The southern continuation of the Nallamalais, called the Lankamalais, which separates the Badvél and Proddutúr taluks should eventually be examined with a view of forming reserves, partly to regulate the water-supply in the Sagilér and Kundu rivers, partly to produce bamboos, timber and fuel which can be exported by the Kurnool-Cuddapah canal.

Iron-smelting is going on near Wanipenta and other villages on the east side of the Kundu valley in Proddutúr taluk, and the forests on the hills which furnish the charcoal for this industry should be examined, with the view of determining whether any reserves can be formed here to secure a permanent supply of charcoal for this purpose. At this village there is also a manufacture of brass utensils. The tanks on the west side of the Lankamalais in the Proddutúr taluk have a most uncertain water-supply, and this might possibly be improved if something could be done to clothe these hills with dense scrub and forest.

386. In the vicinity of Cuddapah it would be very desirable that as many of the dry bare hills be clothed with forest as possible: something in this direction will be accomplished if the reserves here proposed on the Pálkonda range, south of the town, are formed; but the hills south-east of Cuddapah are exceedingly bare and the scorching winds of the hot weather pass over them. It is for consideration whether reserves might not be formed on these hills. The scrub is very scanty, but would revive, if strictly protected against cattle and fire, and after protection has been firmly established, something might be done to increase the forest growth by sowing and planting. An important measure in these blocks would be the construction of dams and embankments, behind which silt would accumulate, the sides of which could be planted up.

Reserves in the North-western Taluks.

387. It now remains to review what is proposed to be done in the more arid parts of the district, comprising the Proddutúr, Jammalamadugu, Pulivendla and part of the Cuddapah taluks, and on the uplands of the Sub-division.

In their orders of 20th September last the Board of Revenue directed that reserves in all taluks of the Cuddapah District should be selected and marked out without delay. Such wholesale action I would strongly deprecate. Steps should at once be taken to guard against the alienation of land suitable for the formation of reserves in the open country, but the work of marking out the lands to be converted into forest must be done gradually and with due deliberation. In the plains of the Proddutúr taluk eight blocks, aggregating 4 square miles, have been reserved, and their protection is supposed to be secured by the appointment of a watcher for each block, who receives Rs. 3 a month. The Tahsildar has proposed twenty additional blocks, aggregating 7 square miles. The total area of the taluk is 486 square miles, so that the area proposed to be reserved amounts to about 2 per cent. of the whole. In addition to these, some reserves may, as already mentioned, have to be formed in this taluk on the Lankamalais.

388. In the Jammalamadugu taluk there are low hills on both sides of the railway. The northern hills, which may be designated as the Gandikóta range, form the southern end of the Yerramalai range in Kurnool. In this district they are exceedingly bare, with flat tops, which are generally cultivated, and deep ravines with springs which have water throughout the year. Near the southern end of this range, the Reddi of a village (Kusinépalle) has preserved a small tract of waste land during the last eight or nine years, employing the village servants for its protection. The improvement has been considerable, the land being now covered with scrub 4 feet high, with nim trees in the lower part. Cattle were kept out for a few years, but they are now allowed to graze in this block.

389. The southern range of hills is known as Bhanakótamalai. Here the people in two villages have protected tracts of about 200 acres each for the purpose of providing good grazing for the ploughing bullocks in the vicinity of the village. Other cattle are not allowed to enter, and it is believed that these tracts are not fired. These reserves of Government waste lands do not pay assessment, and are not held on patta, as are many of those which are reserved by the people in the Coimbatore District. Similar reserves of Government waste for grazing are found in other taluks, and they are generally demarcated by means of stones which are white-washed. These reserves were selected in places with good grass; and their chief object is, as in the case of those on the Bhanakótamalai, to provide good grazing for the plough bullocks.

390. On account of Government 13 plots, aggregating 8½ square miles, were reserved about two years ago on the two hill ranges mentioned, and these it has been lately proposed to extend to an aggregate area of 51 square miles, and to add six plots, aggregating 3 square miles, on the plain. This area is expected to require 20 watchers, who are to get Rs. 4 a month, which will entail a total outlay of Rs. 960 per annum. The protection of well-selected reserves on these dry hills and in the plains of this taluk is a matter of very great importance, but I would urge here as in Proddutúr great system and method in these arrangements. The point to aim at is to protect effectively a few blocks which ought to be as large as possible; and whenever there is a prospect of success, to improve them by sowing and planting, and in the hills by a system of dams across the ravines. When these areas have become converted into dense forest, the advantages to the people in the vicinity will be so palpable that an extension of the work to other areas will be much facilitated.

391. In districts with a dry climate and scarcity of cattle-fodder like Cuddapah, the advantages of affording protection to the grazing grounds are already recognized by the people, and with proper management it will not be found difficult to induce the people to acquiesce in the temporary restrictions which the formation of such reserves necessarily entails. Another advantage of taking in hand a few selected areas in the first instance is, that experience in this business is gained by the Forest Officers, and that it will afterwards be easier to extend the work with more certain prospects of success.

392. Along the bed of the Pennér river, both above the Gandikóta gorge and below it between Jammalamadugu and Proddutúr, also below Proddutúr, extensive stretches, covered with shifting sands, are found, which are very inconvenient, as the sand often covers fields, channels and buildings. Eventually something should be done to fix these sands by planting, and the local Forest Officers should at once pay attention to the shrubs and plants most useful for this purpose. Palmyra trees have been grown in such places, with some success on the Pennér and on the Cheyér rivers.

Near the canal, in the Proddutúr and Cuddapah taluks, there is a good deal of land which has become swampy by percolation. It would be very useful to plant up such land, as well as any waste land irrigable from the canal, which is not likely to be taken up for cultivation.

393. The distribution of lands in the Proddutúr and Jammalamadugu taluks (Fasli 1282—1872-73) was as follows :—

—	Proddutúr.	Jammalamadugu.
	ACRES.	ACRES.
Inam	66,847	67,867
Government land, occupied	105,286	124,241
Government land, unoccupied, culturable	12,490	8,982
Government land, unoccupied, unculturable, and hills .	140,973	188,723
Total ..	325,596	389,813

There is thus in these two taluks an area of over 300,000 acres of waste and scrub at the disposal of Government, and as far as the present proposals go only

about 40,000 acres are proposed to be included in reserves, not counting those which may hereafter be formed on the Lankamalais, and regarding the area of which no estimate can be framed. There is therefore much room for extending operations. Part of the firewood used at Proddutúr is brought from the Lankamalais, part being furnished by the babul trees on fields and in hedges. The price of firewood at Proddutúr amounts to Rs. 9-5-0 a ton, which is much higher than at Cuddapah. The population is about 10,000. The distance from the forests is 25 miles, and the wood is mostly brought in on carts.

In framing a plan of operations, the main point to be kept in view in these taluks appears to be to place as large an area of the hills and broken ground under protection as possible. This must not, however, be held to mean that no reserves should be formed in the plains. On the contrary, it will be most useful to encourage the growth of babul wherever waste land is available for the purpose on black cotton soil.

In Pulivendla no reserves have, as far as I am aware, been formed, but there is a large palmyra tope, several miles long, at Idupalapaya in a side valley of the Pápagni.

394. In these four dry taluks to which the preceding remarks relate, there are, under Jungle Conservancy, a large number of topes, chiefly planted with mango, tamarind, nim and palmyras, an abstract of which is given as follows in the report on jungle conservancy for 1881-82:—

Taluk.	Number.	Area in Acres.
Proddutúr	8	1,596
Jammalamadugu	18	427
Cuddapah	14	279
Pulivendla	16	348
Total ..	56	2,650

These topes are exceedingly useful, and when larger-sized reserves in the plains cannot be formed, the planting of topes of trees is the next best thing to do, and should be encouraged to the utmost.

Reserves on the Gurramkonda Plateau.

395. There remain the taluks of the Gurramkonda plateau, commonly known as the Sub-division. In 1880 Mr. Breeks Atkinson, when Sub-Collector, selected a number of tracts to be declared reserves under Jungle Conservancy, which were then estimated to aggregate 128,000 acres, and Government sanctioned an establishment for their protection at a total annual cost of Rs. 3,300. Regarding this area, the Board of Revenue expressed apprehension that some of the plots might prove unmanageable in size. Accordingly a revision of the boundaries was made which has not yet been completed.

396. In the three taluks—Madanapalle, Kadiri, and Váyalpad,—it is understood that 17 blocks will be proposed, aggregating 82,350 acres. The aggregate area of these three taluks is 2,543 square miles, so that this area of reserves, if approved, would amount to 5 per cent. of the total area, which certainly is not excessive. No proposals have been submitted for the Ráyachóti taluk. As regards the character of the forest, the reserves on the lower hills are said to contain chiefly *Premna tomentosa* (narvu), *Albizzia amara* (chigeri), *Erythroxylon monogynum* (dévadaru); while on the higher hills teak, bamboo, *Chloroxylon Swietenia* (billu), *Anogeissus latifolia* (yellama), *Elæodendron Roxburghii* (niridi), *Buchanania angustifolia* (tsára), *Pterocarpus Marsupium* (yégi), are found.

Regarding the expediency of demarcating and protecting these forests there can be no doubt; but, before they are finally constituted, the boundaries will have to be carefully revised. And it is probable that a much larger area should be placed under protection, if it is intended to improve the water-supply of the tanks and river channels upon which the prosperity of this part of the district depends.

Management of Reserves.

397. Turning now to the management of the reserved forests, I am anxious to state at the outset that their successful protection and economical management depends mainly upon the skilful selection of boundaries. Boundaries should be as straight as circumstances will permit. In the plains and in the open country this is the main point to be aimed at. Every facility should be given for the extension of cultivation up to the edge of the forest. This facilitates protection against fire and protection generally; and, on the other hand, leaves for manure, thorns for fencing, grass, fuel, wood for building and other purposes, and in many cases pasture can be made available to the adjoining villages. It is always a great disadvantage to have a belt of open forest or private forest intervening between cultivation and the reserve.

Roads and paths are useful boundary lines; so are, in the hills, ridges, whether the main ridge of the range or secondary spurs. The great advantage of ridges consists in this, that fires generally travel up hill and can easily be stopped by a fire-line which follows a ridge. Lines of precipices and cliffs are also useful. Rivers and streams may be selected if no better boundary can be got. What should be avoided in hilly tracts are lines which do not follow either roads or any of the main natural features of the country. Where the reserve adjoins jungle or forest, it will generally be necessary to clear a ride along the boundary line, the width of which must depend upon circumstances. The main point to be aimed at is, that the boundaries of a forest should be readily distinguished on the ground, the boundary marks should be conspicuous, and the boundary line should be easily accessible. Wherever necessary, paths should be cleared and made practicable, running either along the boundary or touching the line wherever it can be conveniently managed.

398. The reserves which have already been demarcated, and which are enumerated in paragraph 374, are surrounded by stone walls. This was done as a famine work in 1877; at present I am told they cost Rs. 2-8-0 to 2-10-0 for 66 running feet. Wherever stone walls can be made without undue expense they form an excellent boundary line. When the fence crosses the bed of a stream the gaps must be closed in the dry weather by temporary fences of thorns.

The reserves of Merwara are enclosed by stone walls, while some of the adjoining reserves of Ajmere are surrounded with hedges of *Euphorbia Nivulia*, and it may be possible in some parts of Cuddapah to plant fences of some of the fleshy and prickly species of *Euphorbia*. On this subject reference is invited to paragraphs 12 to 15 of my report on Forest Administration in Ajmere and Merwara, dated the 1st November 1879. The first cost of planting *Euphorbia* fences in that district has been found to be about Re. 1 per hundred running feet for a double line, while stone walls 18 inches thick and 3 feet high have been built for from Rs. 2-8-0 to Rs. 5 per hundred running feet. In the plains, ditches form very good boundary lines, and lines of *Agave* planted on the top of the bank would increase their usefulness. Where fences or ditches are not practicable, boundary marks must be erected instead. A heap of stones with a post in the middle, let into the ground, if possible, is a very good mark as a commencement, but should hereafter be replaced by more permanent marks which will necessarily vary in different parts of the district according to the material available on the spot. Square pillars built up of stones roughly fashioned, without mortar, are very useful. Where sandstone or stratified gneiss is available slabs of stone may be erected, and where durable timber, such as yépi, is abundant, posts 6 to 12 inches square, cut out of heart-wood and roughly squared, and let deep into the ground, are very good.

399. An essential point is that the guard in charge of a block must go round the boundary of his beat and report the condition of paths, ditches, fences, and boundary marks, at stated times, and this should be done by him at least twice a year, before and after the rainy season. Where posts of wood are used, he must on these visits clear them of inflammable matter. A good practice is, where lime is readily obtainable, to require him to whitewash every boundary mark once a year after the rains. Wherever practicable, each boundary mark should have a serial number carved on it and entered on the map of the reserve, and boundary registers

should be prepared for all reserves, as prescribed in paragraph 83 of the Forest Department Code.

400. For the reserves already demarcated, maps have been made on the scale of 4 inches = 1 mile. These maps appear to me to be suitable, the contour lines given are sufficient, without obscuring the map, and it is very convenient that the elevation of numerous points has been entered. It would, however, be desirable if on the maps of reserves made in future the general features of the country immediately adjoining were given, as far as the space on the sheet will permit, so as to indicate to some extent the position of the reserve.

401. A proper organization of the executive and protective establishments in charge of these reserves is essential, and the first step which should be taken is to fix the beat and residence of each Forest Guard. The extent of beats must entirely depend on the character of the country and other circumstances, and at first it will be best to make the beats rather large, and afterwards to diminish their extent if necessary. Each Guard should reside in the village from which his beat is most easily accessible, or in a healthy location in the reserve or on its boundary. The responsibility of a Forest Guard may best be thus defined: that he must be held responsible for all damage done to the forest in his beat which he has been unable to prevent, unless he has discovered and reported such damage within a fixed time to his departmental superior.

402. Ranges in charge of executive officers can only gradually be formed. They will at first necessarily be very extensive; their extent must be diminished as the work may demand, and as the revenue of the forests increases.

The good management of forests is impossible without a system of roads and foot-paths, wells, and rest-houses at convenient places. In paragraph 14 of his report of the 5th February 1878, Colonel Beddome correctly urges the necessity of inspection paths in the plain portions of several of the reserves where the growth is becoming very thick. In these portions of the reserves, which in places are quite impenetrable, cart-roads to facilitate the export of produce should as soon as possible be made. But inspection paths are also necessary in the hilly portions, and the first step must be to improve existing paths, such as the track which runs through the west Ballipalle reserve westward to Chinthagunta in the Váyalpád taluk. Roads and paths can only be made gradually, but the main point to be aimed at is to work upon a well-arranged system.

403. Rest-houses, at first temporary huts, should be built wherever any special work is in progress. It may be objected that huts in those portions of the reserves, which cannot at once be protected against fire, are apt to burn, but this can and must be prevented. It must be made one of the duties of the Forest Guards to clear a sufficient space all round such buildings and to visit them periodically at short intervals.

404. At the outset it will be necessary entirely to exclude cattle from those reserves which it is intended to protect against fire. Goats must always be excluded, except in cases where their admission is based upon specific right. Eventually there will, as a rule, be no objection to the admission of horned cattle, save in those places which have been cut over. Cattle should not however, except in the case of a right, be admitted without payment. Here, as elsewhere in this Presidency, an effort should at once be made, instead of admitting cattle promiscuously on payment of certain rates per head, to enter into agreements with responsible persons residing in the vicinity of the reserve, to whom certain blocks would be assigned for grazing, on payment of moderate fees, on the understanding that the contract terminates as soon as the block assigned to them is burnt. Pasture of cattle in fire-protected forests has the advantage that the grass is diminished and the risk from fire is lessened. But seedlings and coppice shoots are trodden down by cattle, and, as long as fire protection is not yet an established fact, herdsmen will always be under a strong temptation to set fire to the old grass. These matters have to be most carefully considered.

This is the mode in which I suggest that fire protection in the Cuddapah reserves be first commenced.

405. For the protection against fire of selected blocks, which should include

those in which cuttings have been made, a more elaborate system should be introduced. Such blocks must be isolated from the rest of the forest by fire-traces. The best arrangements for the formation of these fire-traces must be worked out by actual experience, and no hard-and-fast rules can be laid down at the commencement. The most effective fire-traces are generally roads or foot-paths, on both sides of which the grass and brushwood is burnt early in the dry season. Fire-lines which follow a ridge or the crest of a spur will be found very effective. In some cases it may be necessary to cut down all trees on these fire-lines, while in others it will suffice to clear grass and brushwood. The main point to be attended to, is to burn the fire-lines as early in the season as possible, and when there are stretches of high grass in the vicinity of a fire-line these should also be burnt. Where there is no shade the grass dries up more quickly and can therefore be burnt early in the season. Where the trees are left standing it will be necessary to hasten the drying of the grass by cutting it.

406. The months during which these forests are driest are February to May; during this period, and in some seasons during a longer period, a staff of special fire-watchers must be entertained, and in order to utilize their services to the utmost, each fire-watcher must be made responsible for a certain length of fire-lines, which he must keep clear of all imflammable matter, and which he must patrol regularly every day during the dangerous season. On account of the very long dry season in this district fire protection will be found to be an exceedingly difficult task, and at the outset the efforts in this respect should be confined to a limited area. This remark relates to the blocks specially selected for fire protection, by means of systems of fire-lines; but, as already stated, efforts should simultaneously be made to secure the protection of larger areas by means of agreements under which these areas are let for grazing.

407. Protection against indiscriminate cutting, against fire, and the exclusion of cattle when necessary, will, if efficient, and under circumstances otherwise favorable, have the effect of converting the reserves into dense compact masses of forest, and will gradually tend to improve the surface soil. In his report of the 5th February 1878, Colonel Beddome states :—

"The dying out of the trees in all reserved blocks (by the drought of the famine years) can easily be prevented by proper conservancy."

And he adds that if the forests were once properly protected, "we should in a few years wonderfully improve the surface soil, the extreme dryness and poverty of which is the cause that the drought is able to effect so much mischief."

In this view of the case I concur. The gradual improvement of the soil will also accelerate the production of wood, and hence the hope expressed in paragraph 377, that, if the forests are protected sufficiently long, the annual production per acre may be raised. But this improvement of the soil is a slow process and its result must be awaited with patience. Protection must not be given up or relaxed because in a few years the annual yield is not found to increase or the revenue does not rise as much as was expected.

408. Planting operations cannot, at the outset, be extensively undertaken in this district. The work which presses in the matter of selecting and demarcating reserved forests and establishing a good system of fire protection will, during the first few years at least, require the undivided attention of the superior and subordinate staff. Here, as elsewhere, the general rule should be observed not to spend money on cultural operations in places in which protection against cutting, fire, and, if necessary, cattle has not been firmly established. When this end has been attained, the experience which has already been gained in the plantations made near the railway line will serve as a most useful guide for future operations. Wherever cuttings for railway fuel have been made, it will be well to aid natural reproduction by sowing and planting, and I would particularly suggest that wherever clearances are made in the evergreen forest on good soil, seed of fast-growing trees, and if possible of those which coppice readily, whether evergreen or deciduous, be dibbled in. I would name the following kinds as worthy of attention in this respect:— *Melia indica; Odina Wodier; Zizyphus Jujuba; Hardwickia binata; Pterocarpus Marsupium; Tamarindus indica; Albizzia amara, odoratissima, procera, Lebbek; Termi-*

nalia belerica, tomentosa, Chebula; Anogeissus latifolia; Nauclea cordifolia, parvifolia; Premna tomentosa; Millingtonia hortensis; Putranjiva Roxburghii; Bischoffia javanica; Mimusops indica, Elengi; Bassia latifolia, longifolia; Diospyros Melanoxylon; Buchanania angustifolia. Other species will readily suggest themselves to an observant Forest Officer. I would recommend sowings as a commencement. Nurseries would require water, and unless large pits were dug, as in the Mysore plantations, the young trees planted out would probably not have much chance of sucess. But experiments should be made. The object is to let the young plants grow up with the coppice shoots in the clearance.

409. It has already been mentioned that the reserved forests of the Cuddapah District must at once furnish a certain quantity of fuel, up to 10,000 tons per annum, for the railway, and it will therefore now be necessary to submit suggestions regarding the arrangements required to make this quantity available. Cuttings have unfortunately already been made in three of the demarcated reserves—Kódúr hill, Yerraguntlakótah and Vacaticónah. When I visited these reserves in December last, there was a great deal of wood on the ground, the tops and branches of the trees cut, and I was afraid that the fires of the dry season would destroy the young growth, and prevent the springing up of seedlings and coppice shoots. I am informed by Mr. Yarde that he has succeeded in protecting Yerraguntlakótah, that large areas were burnt in the Kódúr hill reserve and in Vacaticónah, but that these fires did less damage than was expected, because there was a previous fall of rain and most of the grass was green. The cuttings in these localities were most unfortunate, because the forest had not yet become dense and compact, and the cutting must necessarily have the effect of causing a large crop of grass to spring up, which will make fire protection very difficult until the forest growth has recovered. These cuttings will, unless these reserves are steadily protected against fire, undo much of the good that has been accomplished by the partial protection which these tracts have received.

410. Cuttings should, however, be made freely in all portions of the reserves where the ground is densely stocked with compact forest. By way of illustrating what I mean, I may mention the dense evergreen forest in the Ballipalle reserve, west of the railway, which occupies the level ground at the foot of the hills. While examining this reserve I strongly urged upon the Conservator the expediency of at once making an experimental cutting here. This has been done and the outturn is stated in para. 123 of this report. In this forest, and in all tracts similarly constituted, a system of export roads, which in the plains should, as far as possible, run at right angles to each other, should be laid out, so as to divide the block into compartments. The cuttings should then be made in regular order, and as a commencement, and by way of experiment, I recommend, as already stated in paragraph 354, that narrow belts be cleared, say from 100 to 200 feet wide, alternating with belts of forest left standing.

411. Experience in the teak forests of Burma and in the sâl forests of Oudh, and elsewhere in other Provinces of India, has taught us that the plan of making clearances in narrow belts is most beneficial, in this way, that the standing forest which surrounds the clearance shelters the young growth against wind and against excessive evaporation. It will probably be found that coppice shoots and seedlings which spring up in these narrow belts will grow very luxuriantly. Care should be taken to round off the stumps and to cut the trees close to the ground, so as to improve the growth of the shoots.

As regards the best season for making these cuttings so as to secure reproduction, no rule can be laid down at the outset. This must be ascertained by experience. The result of the reproduction from coppice shoots and seedlings in different localities, and in clearances made at different seasons must be carefully recorded in detail, and great attention should be paid to the development and mode of growth of different species. As a matter of course the quantity of wood cut in each clearing, with the area cut over, must be most carefully determined and recorded.

412. As much as possible, the cutting operations of one season should be confined to one block or to a few blocks contiguous to each other, so that the time

of the superior officers may not be wasted by going backwards and forwards. In many cases well-stocked patches of forest fit for cutting may be found in the valleys at some distance from the line, and in such cases it must be considered whether cart-roads should be constructed to facilitate the export of the wood. No suggestions can at present be made regarding the quantity which should be cut during the first few years, except that the limit of 10,000 tons should not be exceeded, nor can, at the outset, any working plan be framed, but after these operations have been continued during say four or five years, it will be necessary to examine systematically the condition of the whole of the forests from which fuel can be brought to the railway, and upon the result of this examination to base preliminary working plans to regulate the cuttings in future years.

Open Forests.

413. For many years to come, and until the demarcation of the reserves has been completed, the open forests must yield a considerable portion of the revenue, and their protection will demand a large share of the officers' time. Some fuel for the railway will probably have to be cut in these open forests, but this should be done with caution. In tracts which cannot be included within reserved forests, heavy cuttings may be made, but tracts which are likely to be included must, in regard to the arrangement of cuttings, be treated as if they were reserved forest. I am not in a position to estimate the quantity of fuel which, on this understanding, can be cut in the open forests, during the next five years. This can only be settled as the work progresses. But at the outset, say for the next two years, I would suggest that it be settled that the Government forests of this district, reserved and open, should not be expected to yield more than 10,000 tons a year as railway fuel. The main point in regard to these fellings is, that in the reserves, and in the open forests likely to be included within the reserves, no cuttings must be made unless the forest can be sufficiently protected so as to ensure its reproduction. It will probably be possible to make available for export considerable quantities of red-wood and other timbers from the open forests, and in this respect also the principle should be maintained that tracts of open forest which are likely to be included within the reserves should, in regard to cuttings, be treated as if they had been reserved. As regards the requirements of the district, it will probably be best to continue the present license and voucher system, to work it efficiently, and gradually to modify it so as to guard against waste, and to secure the largest possible revenue from it. Turning now to the subject of the protection which should be given to these open forests; this cannot of course be as strict as the protection afforded to the reserves. The most important measure which has hitherto retarded the denudation of the Cuddapah forests has been the circumstance that red sanders has been considered a reserved tree, which could not be cut without permission. It is hoped that, under the Forest Act, it will be possible to continue the protection hitherto given to this tree. Besides red sanders, special protection should be accorded to teak; and it is for consideration whether protection should also be extended to some other kinds, such as yégi, thamba, and jallari.

It would be most desirable if it were possible to stop the firing of grass land and forest which at present is general and which takes place at least once a year throughout the district, and an attempt should be made, under the provisions contained in Chapter III of the Act, to check these annual fires. But I do not advocate that much time and money be spent on such efforts. Fire-protection as a rule can only succeed if attempted in limited blocks of demarcated forest.

Financial.

414. The following statements show receipts and charges on account of Forests and Jungle Conservancy in this district during the six years ending with 1881-82:—

Forests.

Years.	Receipts.	Charges.			Surplus.
		A. Conservancy and Works.	B. Establishments and Contingencies.	Total.	
	Rs.	Rs.	Rs.	Rs.	Rs.
1876-77	47,610	6,788	13,391	20,179	27,431
1877-78	57,190	6,326	14,238	20,564	36,626
1878-79	61,624	12,613	14,385	26,998	34,626
1879-80	53,824	14,003	13,833	27,836	25,988
1880-81	70,328	17,354	14,617	31,971	38,357
1881-82	46,801	16,411	14,195	30,606	16,195
Total ..	3,37,377	73,495	84,659	1,58,154	1,79,223

Jungle Conservancy.

Years.	Receipts.	Charges inclusive of Establishments.	Surplus.	Deficit.
	Rs.	Rs.	Rs.	Rs.
1876-77	3,462	4,840	..	1,378
1877-78	7,652	2,551	5,101	..
1878-79	12,169	3,721	8,448	..
1879-80	24,981	14,341	10,640	..
1880-81	17,627	12,946	4,681	..
1881-82	17,346	17,125	221	..
Total ..	83,237	55,524	29,091	1,378

415. It will be noticed that, as regards Forests, there has been a gradual increase in both receipts and charges, and that the surplus revenue has been maintained in a satisfactory manner. The short revenue in 1881-82 was due to delay in disposing of the stock of red sanders. In Jungle Conservancy there has also been a fair surplus. The chief items of revenue under "Forests" appear from the following figures of the four years ending with 1881-82 :—

—	1878-79.	1879-80.	1880-81.	1881-82.
	Rs.	Rs.	Rs.	Rs.
1. Red sanders sold at depôts	24,300	28,000	34,000	300
2. Jungle wood	4,000	7,000	10,000	11,000
3. Fuel	2,800	3,000	4,000	4,000
4. Railway fuel	28,000	12,000	16,000	26,000
5. Charcoal	250	800	1,000	400
6. Bamboos	700	1,000	2,000	3,500
7. Minor produce	800	900	1,000	1,200
Total ..	60,850	52,600	68,000	46,400

All items, except the amounts realized by the sale of red sanders at depôts, were realized under the license and voucher system.

416. These figures give evidence of careful working by the District Forest Officer. The red sanders sold at depôt consists to a small extent of house-posts, but chiefly of roots, and it is very creditable to Mr. Yarde that the revenue from this item has been so well developed. The short receipts under this head in 1881-82 are due to the fact that the stock in hand (since sold) was retained, because the prices offered were considered too low. Much less information is available regarding the sources whence the Jungle Conservancy revenue has been derived. The following figures show the items realized under the different heads. The revenue from *Jungles* includes seigniorage on wood and the bark of thangédu (*Cassia auriculata*), chiefly collected in the sub-division. Under *Topes* the revenue is principally derived from the lease of fruit-trees, chiefly mango and tamarind, the leaves of palmyras and the sale of palmyra stems cut for building.

—	1878-79.	1879-80.	1880-81.
	Rs.	Rs.	Rs.
Jungles	1,900	2,500	2,300
Topes	10,300	22,200	15,300
Miscellaneous	..	300	..
Total ..	12,200	25,000	17,600

417. The remarks of the preceding paragraphs will have made it clear that the work which has here been suggested, in order to place the forests of this district upon a satisfactory footing will require a very considerable outlay, and hence it is necessary to consider in what manner the revenue produced by these forests may be increased, in order to meet the necessarily higher charges. The following figures exhibit the averages of the five years ending with 1880-81, the actuals of 1881-82 and the estimates of 1882-83, for both Forests and Jungle Conservancy:—

—	Receipts.	Charges.	Surplus.
	Rs.	Rs.	Rs.
For five years ending 1880-81—Average	71,305	33,200	38,105
For 1881-82—Actuals	64,147	47,731	16,416
For 1882-83—Estimates	78,800	51,538	27,262

Looking at the figures set forth in the preceding remarks it is evident that the Jungle Conservancy revenue is very small, if the large area from which it is realized is taken into consideration; and it does not seem unreasonable to suppose that by means of efficient management it may be largely increased. As regards Forests, there seems every ground for believing that the sale of roots and house-posts of red sanders from those forests where the tree is sufficiently plentiful can be further developed. The quantity of railway fuel, which has been annually brought from the forests during the last 12 years, has amounted to 12,500 tons a year. In future only 10,000 tons are proposed to be cut, but it may be possible by good management to realize the same net revenue from this source as hitherto. Under these circumstances it does not appear unreasonable to expect that, without in any way injuring the forests, the gross revenue can be increased up to an average of Rs. 1,00,000 a year during the five years commencing with 1883-84.

CHAPTER VIII.

BELLARY AND ANANTAPUR.

418. The present remarks relate to the old Bellary District, as far as visited by me, and will include what I have to say regarding the district of Anantapúr lately formed. I arrived at Bellary on the 12th December, and devoted the 14th to the 24th to the jungles of the Sandúr State, as well as to those surrounding the Sandúr hills in the Hospet and Kúdligi Taluks. From the 25th December to 1st January I marched from Gudikóta in Kúdligi *viâ* Ráyadrug and Anantapúr to Tadpatri, examining the jungles along my line of march, and particularly those near Ráyadrug and Anantapúr, and on the hills between the latter place and Tadpatri. Major Campbell-Walker, the Conservator, accompanied me on this tour, and I had the advantage of having the company of the Collector (Mr. H. P. Gordon) from the 14th to the 22nd December.

419. Colonel Beddome's report of March 1880 gives a full account of those portions of these districts which contain forest, and the following are the principal tracts mentioned by him:—

First.—The *Hardwickia* jungles on the hills between Tadpatri and Anantapúr.

Second.—The forests of the Penukonda taluk.

Third.—The jungles of the Hospet taluk which surround the Sandúr hills.
Fourth.—The jungles of the three western taluks, viz., Hadagalli, Kúdligi and Harpanahalli.
Fifth.—The jungles of Ráyadrug.

Extent of Government Waste and former management.

420. Besides these jungles, however, there are very extensive tracts of waste lands in all taluks, for this part of the Presidency is very thinly inhabited. The area of these two districts is 11,007 square miles, and the population, which in 1871 was, including Sandúr, 1,668,000, now only numbers 1,337,000 souls, which is at the rate of 121 per square mile. The operations of the Revenue Survey not having yet been completed, there is some uncertainty regarding the area of waste land and forest at the disposal of Government.

The following abstract of the figures in Statement I appended to this report represents the latest available information :—

—	Bellary.	Anantapúr.
	ACRES.	ACRES.
Zemindari and Inam land	826,750	622,028
Government land, occupied	1,189,739	956,081
Do. unoccupied	1,456,151	1,888,771
Total area of the District ..	3,472,640	3,466,880

The area of the Sandúr State is 104,960 acres.

The Collectors of Bellary and Anantapúr have kindly furnished the following detailed statements. It will be noticed, however, that the totals do not agree with those of Statement I :—

Bellary.

Taluks.	Zemindari, Shrotriem and Inam Lands.	Government Lands.					Total Area of Taluk.
		Unoccupied.		Occupied.			
		Unassessed.	Assessed.	Wet.	Dry.	Waste.	
1. Bellary	186,194	15,915	140,479	3,070	199,248	29,393	574,299
2. Ráyadrug	115,078	15,082	271,825	6,398	118,695	21,349	548,427
3. Hospet	65,414	33,265	133,275	9,349	45,795	13,338	300,436
4. Kúdligi	33,731	12,862	376,419	4,112	91,268	18,203	536,595
5. Hadagalli	60,762	9,837	197,615	1,517	146,786	12,437	428,954
6. Harpanahalli	43,115	10,512	248,898	2,513	111,773	14,069	430,880
7. Alúr	160,465	23,525	92,509	51	143,139	8,692	428,381
8. Adóni	179,854	16,526	149,727	2,027	134,910	7,083	490,127
9. Sandúr State	17,834	..	..	..	..	..	17,834
Total ..	844,613	137,524	1,610,747	29,037	991,614	124,564	3,755,933

Anantapúr.

Taluks.	Zemindari Shrotriem, and Inam lands.	Government Lands.					Total Area of Taluk.
		Unoccupied.		Occupied.			
		Unassessed.	Assessed.	Wet.	Dry.	Waste.	
1. Anantapúr	101,369	..	237,793	5,287	108,237	20,751	473,437
2. Tadpatri	91,232	75,218	63,197	5,042	118,316	66,497	369,502
3. Gooty	206,763	66,110	169,559	4,499	139,220	20,959	607,110
4. Penukonda	47,344	363,153	100,909	3,641	52,014	8,459	575,520
5. Madakasíra	2,645	8,504	204,442	1,880	28,907	18,413	288,597
6. Dharmavaram	95,965	57,690	409,429	9,316	94,957	35,806	703,163
7. Hindupúr	44,380	16,128	158,843	2,740	30,880	18,008	270,979
Total ..	613,504	586,803	1,344,172	32,405	572,531	138,893	3,288,308

The area of the Government waste lands, 3,345,000 acres, or 5,200 square miles is so large that we cannot undertake more than to place a small portion under protection as regards forest growth, and hence a selection must be made of those tracts which it appears most urgently necessary to take in hand.

421. The management of the Government waste and forest lands in the Bellary District has, until lately, been exceedingly simple. Grazing is free to everybody and no payment whatsoever is made for pasture. In order to obtain fresh grass, fire is set to the old grass on waste lands in December, January and February, and this is the universal custom throughout the district. Thorns for fencing, firewood, wood for agricultural implements, wood and bamboos for the erection and repair of their houses may be cut by ryots without payment and without special permission. Firewood includes wood required for sugar-boiling. These articles may not be sold by the ryots, except in their own villages.

422. The only articles of forest produce for which payment is made are the following:—

(1.) Firewood for sale at Bellary or other large places, at 6 annas per cart-load and 3 pies per head-load.
(2.) Building wood for sale, if of the ordinary kinds, at the same rate as firewood.
(3.) Charcoal, including charcoal for iron-smelting, at the rate of 10 annas per cart-load of 1,000 lb. and 8 pies per head-load.
(4.) The bark and wood of thangédu (*Cassia auriculata*) is paid for, the bark at Rs. 2 and the wood at 6 annas per cart-load.

Payment for these articles is made to the village headmen or Reddis, by whom the money is paid into the taluk treasury. As far as I could learn, the check on these transactions is imperfect, and the forest revenue derived is insignificant.

Reserves and reserved trees.

423. The shape which forest management must take in the Bellary District is two-fold:—

First, certain reserved trees, if growing on land at the disposal of Government, must be protected more strictly than this has hitherto been done.
Second, certain carefully selected areas must be constituted reserved forests under the Act.

The new Forest Act contains no specific provisions regarding reserved trees, but it is hoped that it will be possible to make rules under it, whereby certain species can be protected. The most important of these is yépi (*Hardwickia binata*). I have had numerous opportunities of examining tracts of this valuable tree in different parts of these districts, and I am able to confirm Colonel Beddome's statement (made by him regarding the Tadpatri hills) that this tree had for some years been protected against cutting. But I also came across many cases where yépi trees had been cut without authority.

Teak is scarce, but whatever there is should be strictly protected. The list of reserved trees, prescribed by the Board of Revenue, includes *Terminalia tomentosa*. Saplings of this tree are not uncommon in the jungles which surround the Sandúr hills, and Colonel Beddome mentions it among the trees found in the Penukonda taluk. At present, as far as I have seen, the tree is cut without restriction, but it should be specially protected.

Mr. Brougham reports a little sandalwood in the Kúdligi taluk. This tree also should be strictly reserved.

424. So far regarding reserved trees. The second principal measure is the demarcation of selected areas, and their strict protection. The chief object in demarcating and protecting these areas is to give to a district with a hot and arid climate, the greater part of which is excessively bare, the benefits of having a certain portion of its waste lands under forest. These forests, after they have grown up, will, we expect, be useful in providing a larger supply of building wood, bamboos, fuel, thorns and other material for fencing, branches and leaves for manure; and in seasons of exceptional drought a more abundant supply of cattle-fodder than is available at present.

425. In addition to these immediate and tangible advantages, we hope that the forests, which we propose to create in these districts, will confer upon the

country benefits of an indirect but far more important character, by regulating and improving the water-supply to streams, tanks and wells, by causing the dew in their immediate vicinity to increase, and by affording shelter against scorching winds and excessive evaporation.

There is good reason to anticipate that in these districts every forest reserve judiciously selected and carefully protected, will be most beneficial in many respects. Nevertheless, as all such undertakings must at first have an experimental character, we propose that operations in the first instance be commenced on a restricted scale, and that they be extended steadily, as practical experience in the business is gained, as the benefits derived from the areas placed under protection manifest themselves, and finally as larger funds become available to meet the necessary outlay.

Climate.

426. The climate of Bellary and Anantapúr is hot and dry. The arid tract with a rainfall not exceeding 20 inches, which, as explained in the Cuddapah chapter, comprises part of the Jammalamadugu and Pulivendla taluks, extends westward in the direction of Anantapúr and Dharmavaram, and comprises the dry, open, undulating country between Anantapúr and Ráyadrug as well as the country about Bellary. This dry tract extends southward through Chitaldrug into Mysore. The country about Adóni and Gooty is moister, and even Tadpatri has a mean annual rainfall exceeding 20 inches. The hills of the Penukonda, Madakasíra and Hindupúr taluks are also moister than the country lying to the north, and are similar in climate to the adjoining taluk of Kadiri. West of Bellary are the hills of the Sandúr State, rising at Rámandrug to 3,160 feet. While Bellary has a rainfall of only 17 inches, Rámandrug has a mean annual rainfall of 37, and Hospet at the northern foot, not far from the Tungabhadra river, has 25 inches. The western taluks of Harpanahalli and Kúdligi have a mean annual rainfall of 21 inches.

427. The distribution of moisture during the year in these two districts will be best understood from the following mean monthly totals for Bellary and Gooty, the result of observations continued during twenty-seven years in the case of the former, during twenty-five years in the case of the latter station.

	Bellary.	Gooty.
January	·10	·05
February	·05	·08
March	·60	·07
April	·82	·54
May	1·90	2·05
June	1·86	2·77
July	1·45	3·02
August	2·32	4·00
September	3·69	4·29
October	3·93	4·16
November	0·73	0·90
December	0·28	0·09
Total ...	17·73	22·02

It will be seen that there is a scanty monsoon from May to October, and a long dry season from November to April.

428. The following is the mean annual rainfall in inches at the head-quarters of most of the taluks :—

Central dry taluks.	
Anantapúr	19·67
Bellary	17·73
Dharmavaram	19·28
Ráyadrug	18·11
North-eastern taluks.	
Adóni	26·59
Gooty	22·02
Tadpatri	20·67

South-eastern taluks.

Penukonda	21·73
Hindupúr	22·02
Madakasíra	26·38

Western taluks.

Hospet	25·01
Kúdligi	21·73
Harpanahalli	20·64

Character of forest.

429. The character of the forest growth in these two districts to some extent accords with the greater or less moisture of the climate. Colonel Beddome in his report of March 1880, gives an interesting account of the forests in the Penukonda taluk, which are probably similar to those in the adjoining hills of the Gurramkonda plateau of the Cuddapah District. Around Anantapúr the country is bare and almost treeless, and the scrub on the hills between that place and Ráyadrug, and between Bellary and the Sandúr hills, is of the poorest character. But in the moister climate of the Sandúr hills, we find, where there has been protection, a dense and varied forest, and even where the jungle has been hacked, burnt, and grazed over, it gives evidence of irrepressible vigor.

I am disposed to recommend that forest officers should study the geographical distribution of the following trees in these two districts :—

(1.) *Hardwickia binata* (anjan, Hind.; yépi, Tel.; acha, Kan.) is scattered through the whole of these districts; but it is limited to certain tracts, and where found it is generally gregarious. Where it has received some protection, as in places near Bellary, and between Tadpatri and Anantapúr, the hills stocked with this tree form a most refreshing contrast to the dry and bare country around. Colonel Beddome mentions it as the principal tree on the Penukonda hills; it clothes the sandstone and calcareous hills of Muchukôta, it is found on gneiss near Ráyadrug, and on hard sandstone at the foot of the Copper mountain and on the outskirts of the Sandúr hills. In Central India it is mostly found on sandstone or quartzose rocks; instances are the anjan forests in Nimár and on the slopes of the Pachmarhis. But it also occurs on trap, as in the Mattergaon forest of South Berar and opposite to it north of the Púrna valley in the south-west corner of the Melghát. But in these two localities the trap contains an unusually large quantity of quartz in veins and nuggets, and the soil overlying it is gravelly and lighter than the soil overlying trap usually is. The question how far the distribution of this tree depends upon the soil and underlying rock is a most interesting one, and I recommend it to the attention of forest officers in this Presidency.

(2.) Sandalwood is found on the Sandúr hills and here and there in the western taluks. Its range of distribution and the elevation at which it is found, should be studied.

(3.) *Erythroxylon monogynum*, (dévadáru), a common shrub all over Cuddapah and Nellore, mentioned by Colonel Beddome among the shrubs growing on the Penukonda hills, found by me in Sandúr, on the low hills between Chornúr and Gudikôta in Kúdligi taluk, and in the yépi forest of Tadpatri.

(4.) *Balænites aegyptiaca*, (hingolee, Hind.; hingalat, Kan.) a characteristic shrub of the dry hills of Central India and the Dekkan, found by me in the vicinity of Sandúr.

(5.) *Canthium parviflorum*, (balasu, Tel.) common in the eastern and southern districts, and in the Tadpatri taluk, found on the hills between Kodair and Anantapúr and east of Sandúr.

It is probable that a number of trees and shrubs of the Dekkan find their southernmost limit in the jungles of the Bellary District, and in the same manner the limit of some of the eastern and southern species, such as balasu and dévadáru will probably be found in these districts; while, as Colonel Beddome observes, some of the trees which belong to the east side of the Peninsula—such as red sanders and thamba (*Shorea Tumbuggaia*) do not extend into these districts.

The following remarks will be limited to those tracts which I had an opportunity of examining during my tour.

Sandur forests.

430. In accordance with suggestions submitted by me to the Madras Government in December 1881, a portion of the Sandúr forests has been acquired on lease.

These forests occupy a range of hills extending for a length of about 28 miles in a south-easterly direction from Hospet. Two rivers, one a small stream which

joins the Tungabhadra near Hospet, the other the Narihalla river and its feeders, divide the Sandúr hills into four main blocks: the Rámandrug range which forms the south-western boundary of the State, and extends from Kanavihalli on the Narihalla river to the Tungabhadra near Hospet; the north-eastern or Jumbanát and Timanaghar range, running parallel to it along the north-east boundary of the State from the Narihalla river to Hospet; thirdly, the Donimallai range extending south from Yettanhalli on the Narihalla river to the south-east limits of the State; and fourth, the Komaraswami range which is situated south of the Narihalla river, and is separated from the Donimallai range by a deep valley drained by a feeder of that river. The area leased amounts to 40,000 acres, and it comprises the greater portion of the three hill ranges first named, and the settlement of its boundaries is in progress. Contiguous to the leased Sandúr forests there is a considerable extent of Government forest in British territory which should be joined on to the leased forests, so that it is probable that an aggregate area of 50,000 acres in three blocks may here be reserved, of which 10,000 acres will be in British territory.

431. If this is accomplished, and if this area is placed under efficient protection the influence of so large a tract of good forest in the midst of a dry and exceedingly bare district, may be most beneficial, apart from its yielding a larger quantity of wood and pasture.

The Narihalla river is the chief feeder of the Daroji tank, a magnificent expanse of water which irrigates a large area; and there is every reason to believe that, as the forest on a portion of the Sandúr hills gets more dense, so will the water-supply in that river last longer into the dry season. And if anywhere we are justified in expecting an increase of rainfall through forest protection, it will be in that part of the Bellary District which surrounds the Sandúr reserve.

432. The chief direct advantages of the formation and protection of this large forest will be the permanent provision for the local requirements, including the maintenance and extension of the existing iron industry, and the supply of fuel for the Bellary-Dharwar railway. These hills have long been the chief source of fuel, bamboos, and small building-wood for the town of Bellary, and their protection will increase the supply of these articles. Since 1871, the collection of seigniorage on wood used for sugar-boiling, produced on Government land, has been stopped. The result has been the denudation of the hills in British territory, and the people are now compelled to purchase the wood for sugar-boiling from the Sandúr forests.

Iron industry.

433. Both the Rámandrug and the Komaraswami hills are rich in excellent iron ore which is found near the surface on the top of these hills, and a considerable native iron industry is in existence all round the Sandúr hills. On my tour I examined the furnaces at the following villages:—

(1.) Kamalapúr, on the north side, about 20 miles distant by road from Rámandrug, from which place the ore is brought.
(2.) Kanavihalli, at the place where the Narihalla river enters the Sandúr hills.
(3.) Mahdapur, six miles east of Gudikôta, distant about 15 miles from Komaraswami hill whence the ore is brought.
(4.) Golapalle, south of Ráyadrug and 35 miles distant from Komaraswami hill from where the ore is brought on bullocks. This was the information obtained by me on the spot; the Bellary Manual (page 278) states that in Ráyadrug, iron ore is procured by washing the iron sand found in some of the nullahs.

These are the villages where I found furnaces at work near my line of march, but besides these there are numerous iron-smelting villages in the country which surrounds the Sandúr hills on the north, south, and west, wherever there is sufficient wood for charcoal. The following is the number of furnaces in the taluks surrounding Sandúr, as given me by the local revenue officers:—

Hospet	... ...	15 furnaces.
Hadagalli	... ...	2 „
Harpanahalli	... ...	13 „
Kúdligi	... ...	11 „
	Total ...	41

This list does not include the furnaces in Ráyadrug or the adjoining Molkálmuru taluk of Mysore, nor those in the Sandúr territory. At Kanavihalli in Sandúr I saw six furnaces and numerous forges at work and there were more in the vicinity. The charcoal mostly used is that made from *Albizzia amara* and *Acacia Catechu*.

434. The ore is hematite, and the following is the result of the analysis of a sample sent by me from Kamalapúr to Mr. Medlicott, the Superintendent of the Geological Survey, Calcutta.

"The ore is a very pure granular red hematite, which yielded on analysis :—

Ferric oxide	97·3	= 68·1 per cent. iron.
Insoluble matter	1·2	
Undetermined	1·5	
	100·0	

The iron produced in these furnaces is partly used to make axes and other implements, partly for the manufacture of the large iron pans in which the juice of the sugar-cane is boiled. These pans are generally 8 feet in diameter and 2½ feet deep. English iron is said to be not so suitable. When these heavy pans are repaired, they are raised and turned over from the forge to the anvil and back again by a most ingenious arrangement of large levers.

435. As Mr. Medlicott informed me that the iron industry in this locality had not been described, the following notes written during my tour may not be out of place :—

"The furnace consists of two portions; the upper portion has the shape of a truncated cone 9 inches in diameter at the top, and 18 inches at the base, having on its top a wide cup or funnel of burnt clay, the mouth of which is 24 inches in diameter. The lower half of the furnace, also 2 feet high, is open in front, the back being formed by a solid mass built up of mud and stones, about 4 feet square. The front wall is built up each time the furnace is filled, with wet clay, in a most ingenious manner, the portions of this front wall consisting of (1) a substantial cylinder, 9 inches long, of unburnt clay, through which the nozzle of the bellows passes; (2) one long middle, and two long side pieces, which are placed on the cylinder for the bellows, and on its sides. All openings are closed with wet clay, but before this front wall of the lower half of the furnace is built up and closed, the charcoal-fire at the bottom is lighted. The furnace is then filled with the ore (in pieces of the size of a large bean) and charcoal in alternate layers, and the bellows are set in motion. When the operation has commenced, a small round hole is made in the clay which closes the cylinder. This hole is made above the nozzle of the bellows and it serves to see the state of the iron at the bottom of the furnace and to test it, which is done by means of an iron probe. The bellows are made of buffalo hides, each worked by one man. As soon as smoke is seen to issue from the charcoal with which the funnel is filled, a red-hot iron is held over it, the carbon monoxide is set on fire, and continues to burn throughout the operation.

"For the extraction of the slag there is an opening at one side of the furnace in the solid foundation of masonry of which the lower part consists.

"When the iron is ready, the front wall is broken up and the lump removed. The slag is beaten off with small iron hammers on long handles, and the first operation then is to cut the lump in two, which is done by two men with heavy axes. The two halves are then heated in an open charcoal fire with a pair of bellows, like those of the furnace, and hammered out into bars, 12 to 20 inches long, and about 2 inches broad, or into plates for sugar pans, or into axes, picks and other tools.

"The furnaces are generally kept at work ten hours daily, during which time they are filled three times, each filling yielding about 15 lbs. of wrought iron which is said to sell at the rate of three to four rupees for the local maund of 26 lbs. The furnaces are worked during six months, from October to March, the other six months being employed in making and collecting charcoal and bringing in the iron ore. Assuming 100 working days and 45 lbs. of iron daily, the annual outturn of each furnace would be 4,500 lbs. of iron fetching Rs. 605."

436. The want of charcoal is the chief difficulty under which the iron industry in this part of the Bellary District labors, and the protection of the forests on these hills will remove this difficulty.

With an abundant and permanent supply of charcoal in the immediate vicinity of the ore, there seems no reason why the iron making should not be carried on in larger furnaces and on a much larger scale than at present. I understand that certain concessions of mining rights have been made to an outsider by the Rajah, and it is to be hoped that these concessions will not interfere with the free development of the native iron industry which depends upon the Sandúr iron ore.

Railway fuel and timber.

437. The railway from Bellary to Goa will traverse a length of about 140 miles before it reaches the forest tracts of the Dharwar District, and the Sandúr forests are for a considerable distance out from Bellary, if not the only, at all events the chief source whence a permanent supply of firewood for the service of that line can be expected. When considering the question of a lease of these forests, I came to the conclusion that an area of 27,000 acres, which comprised the tracts visited by me, might be expected to yield 4,260 tons of wood annually, after fire protection had been completely established. Accepting this estimate, which is exceedingly moderate, for the entire area, 50,000 acres would yield 7,900 tons annually. The Bellary-Goa line is not likely at the outset to consume at the rate of 100 tons per mile a year, which is the consumption of the Madras railway, but no estimate can yet be framed regarding the length of the line which the Sandúr forests will be capable of supplying with fuel.

438. Though the production of fuel for the railway and for iron smelting is the chief and immediate object of protecting and improving the Sandúr forests, they will doubtless eventually be in a position to furnish timber to a considerable extent. Even at present bamboos and small building-wood are exported from them, and protection will have the effect of improving the size of the bamboos produced there, and of increasing the quantity available for export.

Besides teak (sagwan, Hind.; tegada, Kan.), which though small is common in many places, there are the following species, the wood of which will eventually sell at rates much higher than can be realized from firewood or charcoal:—

Pterocarpus Marsupium (bija, Hind.; honné, Kan.), *Dalbergia latifolia* (shisham, Hind.; bité, ibri, Kan.), *Anogeissus latifolia* (dhebri, Hind.), *Lagerstrœmia parviflora* (burra, Hind.; chenengi, Kan.), *Hardwickia binata* (anjan Hind.; acha, Kan.), *Terminalia tomentosa* (sadra, Hind.), *Grewia vestita* (dhamin, Hind.; jana, Kan.) The Hindi names of these trees are those used by a village of Banjáras settled at Rámandrug. I collected a long list of these names on the spot, most of which I found to agree with the Hindi names used in Northern India. Of the Kanarese names, some appear to be local, and unknown in Mysore.

439. The teak on the Sandúr hills has probably never attained such large dimensions as that in the moister climate near the ghâts, yet I found stumps of fair size, and it is not impossible that the teakwood which is found in the old buildings of Vijiyanagar (Hampi) was brought from the Sandúr hills. Regarding the durability of the teak found in these buildings, the following extract from my journal will be read with interest:—

"When examining the ruins of the old city of Vijiyanagar on the banks of the Tungabhadra river, in company with the Collector, we found that the superstructure of brick and mortar, resting upon that portion of the Vittalarayaswami temple which consists of hewn stones, is supported by planks of wood, which on examination proved to be teak. These planks are about 1½ inches thick; they are in a good state of preservation, and show the peculiar structure of teak in a marked manner.

"The city of Vijiyanagar was founded by Bukka and Harihara, the first kings of the Vijiyanagar dynasty, about the middle of the fourteenth century, and the Vittala temple is believed to be one of the oldest buildings in it. There is no ground for supposing that the upper part of the temple is of a more recent date, and there seems every ground for assuming that the planks have been in these buildings for 500 years. The climate here is very dry, and this is doubtless the chief cause why the planks have been so well preserved. Nevertheless the case is very remarkable."

Character of Sandur Forests.

440. While the rocks near Bellary and on the hills between Daroji and Kamalapúr chiefly consist of gneiss and granite, those of the Sandúr hills are more recent stratified rocks, mostly hard dark-colored sandstones, and the soil which they produce is very favorable for forest growth.

As regards the prevailing trees at the foot of the hills and on the lower slopes, *Acacia Catechu* and *Dodonœa viscosa* are exceedingly common, both more or less gregarious and often associated with teak, *Terminalia tomentosa*, and other trees of the dry forest, and with various thorny shrubs, of which *Gymnosporia montana* is the most common. On the north-east side *Albizzia amara* is frequent near the

foot of the hills. Here and there stretches occur stocked with *Hardwickia binata*. In ravines and along stream beds *Pongamia glabra* and *Vitex Negundo* are common. Higher up we find the trees of the ordinary deciduous forest, the principal being, in order of predominance, *Terminalia tomentosa*, *Diospyros Melanoxylon*, *Tectona grandis*, *Anogeissus latifolia*, *Lagerströmia parviflora*, *Dolichandrone crispa*, *Buchanania latifolia*, *Elæodendron Roxburghii*, *Wendlandia tinctoria*, *Eriolæna Hookeriana*, *Semecarpus Anacardium*, *Phyllanthus Emblica*, *Soymida febrifuga*, *Boswellia thurifera*, *Chloroxylon Swietenia* and sandalwood (*Santalum album*). At higher elevations, say above 2,500 feet, the forest somewhat changes its character, the dominant trees being *Terminalia bellerica* and *Chebula*, *Diospyros montana*, *Cordia Macleodii*, *Pterocarpus Marsupium*, *Dalbergia latifolia*, *Careya arborea*, *Kydia calycina*, *Eugenia Jambolana*, *Putranjiva Roxburghii*, *Mimusops Elengi*, *Chickrassia tabularis*, kul-hathari (Kan.), *Schleichera trijuga*, with the small bamboo, *Dendrocalamus strictus*. The forest on these hills much resembles in character the forest in similar localities in the Dekkan, Berar, and parts of the Central Provinces. The forest is dense and compact only on an area of about 1,500 acres below the military station of Rámandrug, situated near the crest of the hill, on the eastern slope, which has been protected for a considerable number of years. This tract is now nearly safe against fire, the grass having been killed by the cover overhead.

Of the remainder, a portion of the eastern slopes is fairly well stocked with saplings and small poles, up to 15 feet high; but with a large amount of grass from 4 to 6 feet high, which is burnt annually between December and February. The plateau is not very broad, except at Rámandrug itself, and is mostly stocked with grass, with isolated groups of trees and shrubs, a gregarious *Strobilanthes*, with rough leaves, forming dense underwood under the trees.

On the west side, the heads of ravines and valleys are fairly well stocked with saplings, poles, and stunted trees; but the lower slopes have been much denuded. Teak however has to a certain extent been preserved, and well-grown teak poles up to 30 feet high are not uncommon.

Excepting the protected area already mentioned and some portions of the Rámandrug plateau, fires pass through the forests annually; but in spite of this, the stature of the saplings and poles is excellent, with the last season's terminal shoots up to 2 feet long. The soil is most favorable for the growth of forest, and there is no reason to doubt that under efficient protection a dense, compact forest, 40 to 60 feet high, would grow up, wherever the slopes are not precipitous, or the rock is not close to the surface.

Management proposed.

441. It is essential for a successful management of these forests, that good boundary lines be selected. Protection is greatly facilitated by convenient and easily-accessible boundaries.

As regards management, the first task to be accomplished is protection against fire. Upon success in fire protection the improvement of these forests and their production of wood, bamboos and timber will entirely depend. This work must be undertaken very methodically, and the plan to follow should be at first to take in hand a limited area, and not to extend operations until protection has been firmly established in that area.

The first block taken in hand might be that situated on the eastern slope of the Rámandrug range, the lower boundary being the limit of the leased forest, while the upper limit would run along the crest of the ridge. Rámandrug village will have to be isolated by a broad fire-trace, the grass outside the protected block all round will have to be burnt as early in the season as possible, and on the secondary ridges fire-traces must be burnt running from the upper to the lower boundary line. It should be borne in mind that in a hilly country all fire-traces must be made accessible by paths along them. As the 1,500 acres of old protected forest below Rámandrug will be the first block where cuttings will be made, export roads should be constructed in this block and fire-traces should be cleared along these export roads.

The task of putting the Sandúr forests in order is a most important and a most difficult one, and in a memorandum submitted to the Government of Madras

on the 13th June last, I urged that a Forest Officer of great experience be appointed under the Collector for the charge of the Bellary forests. I pointed out that the selection of the boundaries and the organization of the work of protection must be entrusted to an officer who has had practical experience in the demarcation and management of reserved forests, and that the success or failure of this undertaking will chiefly depend upon the measures taken at the outset for the demarcation and protection of the forests.

Other Forests in the Western Taluks.

442. The Sandúr forests will, for a considerable time to come, be the chief work of the Bellary District Forest Officer, and during that time all his work should be as near the Sandúr hills as possible. Hence the formation of reserves on the hills between Bellary and Sandúr will probably be the first work to be undertaken by him in addition to Sandúr. The following extracts from my journal regarding some of these tracts may be found useful:—

"WEDNESDAY, 14TH DECEMBER 1881—BELLARY TO ANTAPUR.—Left Bellary about 7 A.M. and drove to the foot of the Tumti ghât, which crosses the northern continuation of the Copper mountain range into the Antapúr valley. This valley lies between the Sandúr hills on the west and the Copper mountain on the east side.

"The Copper mountain is a mass of hills stretching from north-west to south-east, and rising to 3,148 feet (1,600 feet above the level of the surrounding plain). From a distance the slopes appear entirely bare, but on closer examination numerous small shrubs and the shoots of trees are seen, and in some of the valleys there is a good deal of stunted forest growth, kept down by cattle and fires. There are considerable patches stocked with coppice of *Diospyros Melanoxylon*, and there are stretches of *Dodonæa*, easily recognized from a distance by their light green color. The rocks near Bellary are gneiss or granite, while the Copper mountain consists of more recent stratified rocks.

"After entering the Antapúr valley, I turned south and visited a forest of *Hardwickia* (yépi), about six miles south-east of Antapúr, near Mulpanagúdi village, which occupies a stretch of high ground descending from one of the outlying spurs of the Copper mountain. The area covered with this tree is about 1,000 acres, and the trees stand thickest on the flat below the foot of the hill. On the slopes they are more scattered.

"The *Hardwickia* trees now on the ground are all coppice or pollard shoots from stumps and trunks cut many years ago. This tree has evidently here been protected during a series of years, and the shoots are clean and straight.

"The trees are up to 30 feet high, and at the time of my visit were laden with seed expected to ripen in spring.

"On my way north to Antapúr I passed the village of Avinamadugu, situated near a large tank which was nearly full. The water is chiefly used here for irrigating rice fields, and on the east side of the Sandúr mountains, the tanks are mostly filled by the showers of the north-east monsoon in October and November."

"THURSDAY, 15TH DECEMBER—ANTAPUR.—Excursion to Oblagudi, a large village at the foot of the Sandúr hills, about six miles south-west of Antapúr. The path crosses a large extent of high unculturable ground, with the rock close under the surface, and stocked chiefly with *Carissa Carandas* (the leaves here generally greyish), *Rhus mysorensis*, *Acacia Catechu*, *Latronum*; *Gymnosporia montana*, *Dolichandrone falcata*, *Grewia vestita*, *Albizzia amara*, *Acacia eburnea*, *Randia nutans*.

"Of less importance are the following. *Vitis pallida*, a vine with large glabrous leaves, the same species which is common on the dry hills of the Poona District, and which I found south as far as the Javádis in Salem. On dry rocky soil it is an erect shrub, but in moist places a powerful climber; *Grewia pilosa*, *populifolia*; *Zizyphus Œnoplia*; *Dichrostachys cinerea*; *Cassia auriculata*; *Canthium parviflorum*; *Acacia leucophlœa*; *Bauhinia racemosa*; *Givotia rottleriformis*; *Dodonæa viscosa*; *Ixora parviflora*; *Capparis Roxburghii*; and here and there a few trees of *Hardwickia binata*.

"The species here enumerated may be taken as constituting most of the jungle outside the higher hills. The character of this jungle however varies exceedingly according to locality. In some cases *Hardwickia*, in others *Acacia Catechu* and elsewhere *Dodonæa* are the dominant species. Behind Oblagudi is a narrow gorge opening out into a wide basin in the Sandúr hills, spreading out like a fan into a number of valleys, the sides of which are fairly well stocked with teak, *Terminalia tomentosa*, *Anogeissus latifolia*, *Lagerströmia parviflora*, *Diospyros Melanoxylon*, *Chloroxylon Swietenia*, *Wrightia tinctoria*, *tomentosa*; *Soymida febrifuga*, *Cassia Fistula*, *Dalbergia paniculata*, and *Boswellia thurifera*. On the slopes, large specimens of *Euphorbia neriifolia* in full leaf, with a full round crown of dense foliage. These are the principal trees of the deciduous forest in this locality.

"Returning to Antapúr by a road which skirts the foot of the hills, I noticed that many of the trees and shrubs of the hills also occur on the flat adjoining the foot. In ravines and along stream-beds, I found besides *Eugenia Jambolana*, *Nauclea parvifolia*, *Nerium odorum*,

Pongmiaa glabra, Phœnix sylvestris, and associated with this palm masses of the bushy *Acacia eburnea,* with fragrant golden yellow flower heads. Near villages, *Acacia arabica, Ficus Tsiela, Grewia villosa* (in hedges), *Calotropis, Albizzia Lebbek,* and *Euphorbia Tirucalli* were common.

"A path leads up the Oblagudi valley into the Sandúr hills, crossing over into the upper part of the valley which joins the Narihalla river at Nagar. By this path bamboos and sticks used for rice-pounders are exported by Banjaras and are taken to Bellary in head-loads. Bamboos 5 feet long pay duty to the forest contractor of the Sandúr State at the rate of one and a half annas for thirty bamboos forming one head-load. At Bellary they sell for one anna a piece. The rice-pounders five feet long and two inches diameter pay duty at the rate of one anna each. At Bellary 11 pieces (one load) sell for Rs. 1-12-0 to Rs. 2.

"The people of Oblagudi village pay to the forest contractor five annas for each pair of cattle, and this payment gives them, in addition to pasture, the right to cut wood, bamboos and grass in the Sandúr forest for their own requirements. Higher rates are demanded from the people who inhabit the more open country further north. Thus the inhabitants of the British villages of Nagalapúr and Ganglapúr on the Narihalla river pay four annas for each head of cattle, and they have to pay for wood, bamboos, and grass in addition."

"FRIDAY, 16TH DECEMBER—ANTAPUR TO DAROJI.—Followed a road constructed during the famine which leads to Wadu, a large village on the Narihalla river. Vast extents of useless waste, mostly rocky, alternating with small stretches of cultivated land, the fields being irrigated from tanks or wells. After passing the village of Kodal, entered the large hilly tract assigned to the Commissariat Department for the grass supply of the troops stationed at Bellary. This tract is well demarcated by upright granite slabs, larger ones with consecutive numbers and four or five smaller ones between two larger ones. The tract comprises the hills north of Antapúr. Altogether it is eight miles long and three miles wide, and it is said that it has been thirty years in the hands of the Commissariat. At a distance these hills are readily recognized by their whitish color, while the other hills in the vicinity, which are grazed over regularly, have a dark brown tint. The shrubs on this tract are chiefly *Acacia Catechu, Dolichandrone falcata, Grewia vestita* and *Gymnosporia montana.* On low flat ground *Acacia Latronum* is found, and in such places it is often gregarious to the exclusion of other shrubs. On the top of the hills *Soymida febrifuga* is common, attaining in places a considerable size.

"Against the cattle of villagers this tract is carefully protected, and to some extent also against fire; for in many places we found the dry grass of previous seasons on the ground. But everywhere there were marks of cutting, and in places there was nothing on the ground save coppice shoots of a few years growth.

"Hence the improvement of the forest growth in this tract has not been considerable except in the recesses of valleys and in other places difficult of access, where trees of fair size are numerous. In such places the coppice shoots of *Diospyros Melanoxylon* and other trees cover considerable tracts. Before turning off to Daroji, rode to the village of Nagalapúr at the foot of the Sandúr hills.

"Daroji is a magnificent tank, three miles long and 1½ mile wide, fed by the Antapúr stream and the Narihalla river; it irrigates 1,200 acres, chiefly sugar-cane. There is a fine forest of babul, in the spread of the tank opposite the bund. Below the bund, however, a large tract has been rendered swampy by the water which percolates through the bund. This tract might probably be drained and used to plant a forest of babul and other trees. At present many of the trees below the bund have been killed by excessive moisture.

"Sugar-cane is the chief crop irrigated from tanks in the western portion of the Bellary District, and the consumption of firewood for sugar-boiling is very considerable."

"SATURDAY, 17TH DECEMBER—DAROJI TO KAMALAPUR.—Examined the hills between the Bellary-Hospet and Daroji-Kamalapúr road. They are a mass of gneiss and granite boulders with stretches of flat ground on the top. Near Daroji these hills are severely grazed over, but further west the vegetation is better, and in places is capable of producing fair forest if protected.

"*Albizzia amara, Diospyros Melanoxylon, Wrightia tomentosa, Carissa Carandas, Cassia auriculata, Grewia Rothii* (narrow grey hoary leaves), *Grewia vestita, Acacia eburnea, Ixora parviflora, Cassia Fistula* were the principal kinds noted, but in most cases these are only stunted bushes. There is water in many places on these hills, and much may here be done by groins and embankments across shallow valleys to form stretches of good soil by the accumulation of silt."

443. The Mulpanagúdi tract has, I understand, since my visit, been placed under protection, and besides this I recommend particularly the range of hills between Daroji and Kamalapúr visited by me on the 17th. There are extensive sugar-cane fields below the Daroji tank and elsewhere in the vicinity, and the fuel for boiling the juice has mostly come from these hills, the result being that there is now nothing left to cut.

Under strict protection even the poor scrub on these hills will improve, and then under a proper system of working, fuel for sugar-boiling may be had by the people close to their villages. Even charcoal for the iron furnaces of Kamalapúr may eventually be got from these hills. It may be urged that the hills between Antapúr and the Daroji tank, which have been in the hands of the Commissariat

for thirty years, have not improved much. But on these hills the trees and shrubs have not been protected against cattle, and fires have not been regularly excluded.

Dry stony hills, with only the poor scrub here described, and in many cases with all hope of reproduction from shoots destroyed by the digging out of their roots, cannot be expected to make the same progress as the Sandúr hills with a much better forest growth, or as the stretches of *Hardwickia* forest; and as a rule I am certainly disposed to recommend that the most promising tracts, and those which have the best soil and the best growth upon them, should be taken in hand first.

444. All these things must be carefully considered, and progress in demarcation must be gradual. At first the leased forests, and those which immediately adjoin them in British territory, must be demarcated, partly under the lease and partly under the Act, and must be placed in order; and when this has been accomplished, other tracts may be taken in hand. The reports by Colonel Beddome of March 1880 and by Major Campbell Walker of the 18th March 1882, submitting to Government reports by Mr. Brougham, making suggestions regarding the formation of reserves in the Kúdligi, Hospet, Hadagalli, and Harpanahalli taluks will furnish valuable data for the guidance of the officer who may be charged with the selection of the reserves to be demarcated, but the suggestions submitted are not sufficiently matured, to justify action upon them without further enquiry on the spot.

Rayadrug Taluk.

445. After the work in the western taluks has been completed, Ráyadrug will require attention. Ráyadrug is a large place with broad clean streets, fine houses, and 8,000 inhabitants, a large proportion of whom are weavers and traders. Firewood brought into the town by ryots for their own use is free; what is sold is supposed to pay at the rate of six annas per cart-load. But in 1880-81 the collections on this account amounted to only Rs. 50, corresponding to 133 cart-loads, an incredibly small amount for so large a place. In the vicinity are villages with iron furnaces, and factories of glass bangles. The formation of reserves on the hills in the vicinity of these villages and of the town of Ráyadrug is necessary, and it does not seem impossible that if more attention is paid to the collection of forest revenue, the necessary outlay may to some extent be covered by the sale of forest produce.

On the road from Hanigal to Ráyadrug there is good forest of *Albizzia amara* on both sides of the road in British as well as in Mysore territory, and on an excursion which we made to the village of Golapalle, which is some six miles south of the road, we came through a considerable jungle of *Zizyphus Jujuba* on low grass-land; and on the rising ground, *Acacia Latronum*, *Grewia Rothii* and *vestita*, with a small mixture of *Carissa Carandas*, *Randia*, and *Albizzia amara*. Here, as elsewhere, *Albizzia amara* had been cut out and the thorny *Acacia Latronum* had been left standing. Further on we came upon a tract stocked with *Hardwickia*, which had apparently been protected of late years, with tall young stems, the pollard shoots of old gnarled trunks. On the hill which overhangs the Golapalle plain, there is a considerable quantity of *Mimusops indica* of fair size.

446. On the road from Ráyadrug to Anantapúr, about half-way between Ráyadrug and the Hagari river, near the villages of Kondápúr and Dharmapuri, between the road and the hills on the north of it, I found a tract of what was said to be Government land stocked with *Acacia Latronum* and a good deal of *Albizzia amara*.

447. The extensive tract of black soil near Billagupa, like the other black soil tracts in the Bellary District, probably requires the attention of the forester less than the tracts of red and mixed soil which are found in the vicinity of the hills, by reason of the great power which the black soil has of absorbing and retaining moisture. But the broken ground in the vicinity of both the Hagari and the Pennér rivers is extremely arid, and when the work of selecting reserves is commenced in Ráyadrug and Dharmavaram taluks, and in the southern taluks of Anantapúr, the formation of reserves along the banks of these two rivers should be seriously considered. These rivers are most important for irrigation in the dry season when the underground current of water is tapped by means of channels dug into the sand, and I was informed on the spot that during the late famine there was always water under

the sand in the Hagari. The Chitravâti, one of the principal feeders of the Pennér, which both in the Anantapúr District and in Cuddapah is of use for irrigation, derives a considerable portion of its supply from the Penukonda hills. If dense forests could be formed along this and other feeders of the Pennér and some of those of the Hagari, the dry season water-supply in these two rivers would probably be improved.

448. From page 92 of the Bellary Manual I gather that near Honúr on the banks of the Hagari river there are hillocks of moving sand which advance in an easterly direction when the strong westerly winds blow in the months of June, July and August. It is said that their mean annual progress is 2½ yards; that in 1825 the village of Bodurti was entirely covered by these sand dunes; and that in 1832 the sand rose in the streets of Honúr to the height of five feet. This is similar to what happens on the banks of the Pennér river near Tadpatri and in the Cuddapah District, and is what may be expected to occur in an arid climate. I may here mention that sand dunes caused by denudation seriously threatened the town of Jeypúr in Rajputana about twelve years ago, but that there their progress was stopped by placing the sandy tract under protection. Along the Hagari and the Pennér rivers there is an ample field for beneficial action on the part of the forester.

Anantapur District.

449. Of Anantapúr I saw what probably is the driest portion of the district, on my march from Billagupa to Tadpatri *viâ* Anantapúr. In this tract of country, I was much pleased to notice the care and intelligence bestowed by the ryots upon irrigation from wells. The wells are large, 40 feet in diameter, the sides carefully lined with walls of hewn stone. A number of these large wells are generally in a valley, and the whole area of irrigated fields is enclosed by belts of trees and tall hedges of *Euphorbia Tirucalli*, which must have the effect of checking evaporation. Rice and ragi (*Eleusine Coracana*) are the principal crops grown under these wells. Such wells could doubtless be dug in many valleys where there are none at present, and in many cases the water-supply of these wells might be increased by placing the hills which surround them under protection. In order to create such forest it may often be necessary to take up culturable land. The dry crops on these hills are mostly grown with long fallows between, so that most of the waste lands are under crop at one time or other. But there is very little doubt that the productiveness of the remaining lands would be greatly improved by the formation of forests; and hence the taking up of such lands for protection would be no hardship to the people. In addition to the beneficial influence upon the water-supply, the advantage of such forest to the people would be, ample provision of leaf manure, of material for fencing, more firewood, more grass and fodder from trees during seasons of drought.

450. The following extract from my journal may be found useful:—

"FRIDAY, 30TH DECEMBER—KODAIR TO ANANTAPUR.—Extensive and thick jungles of *Phœnix sylvestris* (seindi), in stretches of low ground, similar to those in the dry districts of Mysore. The right of tapping these trees for toddy in the entire district is leased to one contractor, who sub-lets the contract by taluks. Grazing and the cutting of other woods is permitted in these jungles. Made an excursion to the hills north of the road, on the borders of Anantapúr and Gooty taluks, called the Sheddanapet hills. Passed through the village of Karmúr with large areas of cultivation from wells. The better houses in this and other villages have flat roofs, while the poorer classes (it is not a question of caste) have thatched roofs. In all, however, wooden pillars and a great deal of other wood work, all from trees grown near villages. Young groves planted of neem and babul, near Potacheruvu and other villages.

"A most useful reserve might be formed on the hills north of Karmúr, including the heads of several valleys which go in all directions feeding important tanks all round these hills. I suggest that a commencement be made in the lands of the Karmúr and Kotanka villages, and that the reserve be afterwards extended over the whole of the Sheddanapet block of hills. The hills are very rocky, a dark-colored gneiss or granite, with numerous black heaps of loose stones and rock on the crest and tops of hills, at a distance resembling trap. The valleys are also very stony; here and there a field is cleared, the larger stones collected in heaps, and kulti (*Dolichos biflorus*), and sometimes bajra (*Penicillaria spicata*) or millet are sown. But only one crop is taken, the land is then allowed to lie fallow for a number of years, and I am informed that the man who originally cultivated it does not as a rule return to the same place.

"The scrub in this area is very sparse, *Acacia Oatechu* is the chief tree, but never more than 10 feet high. Where there is a little soil *Acacia eburnea* is common, which at this season quite scents the air with its numerous small golden yellow flower heads. *Canthium parviflorum* (balasu, Tel.), with its straight slender thorns and large rather thin leaves and round yellow berries which are eaten, but barely ripe here (they were ripe a month ago in the Nellore District), is very common. A species of *Zizyphus*, with red branches, stout formidable thorns and small green round fruit, is the next common, and then *Acacia Latronum*, gregarious on the top of the hills, *Rhus mysorensis* (fruit ripe) *Zizyphus Jujuba, Acacia leucophlœa, Carissa Carandas, Flüggea Leucopyrus, Albizzia amara, Bauhinia racemosa*, and *Wrightia tinctoria*. Along the road, which we joined seven miles from Anantapúr, babul planted in old tank beds."

"SATURDAY, 31ST DECEMBER—ANANTAPUR TO NAINAPALLY.—The Anantapúr tank is a magnificent work, and the view from the bund very fine. On three sides the tank is surrounded by bare hills, which have a most desolate appearance. At this the most favorable time of the year, the country looks parched and much worse than the hills around Ajmere to which there is otherwise a certain resemblance. So much more pleasing is the contrast of the large extent of emerald green paddy-fields below the tank. There is apparently no waste of water, no swampy ground below the bund; only fields and channels. Two crops of rice in the year, and the assessment is between Rs. 3 and Rs. 12 per acre. The area irrigated by the tank is 1,500 acres, upon which the assessment is said to amount to Rs. 12,000 a year. On the bund there are some specimens of *Acacia planifrons*, the umbrella thorn of Madura and Tinnevelly, with horizontal branches. This tree is also cultivated near Bellary.

"A most desolate country between Anantapúr and the hills, at the foot of which the large and beautiful Shinganamalla tank is situated. This tank irrigates the lands of eight villages situated in a valley which makes its way through the hills in a northerly direction to the Pennér river. Vast extents of waste lands, with here and there a poor crop of kulti (*Dolichos biflorus*) and arikata (*Oplismenus Colonus*). On the hills nothing save shrubs of fleshy *Euphorbia* and a few tufts of grass.

"This part of the Anantapúr taluk is a dreary waste, with here and there an oasis of fields irrigated by tanks or wells. If it were not for the streams which come from the hills further south and which feed the Anantapúr and Shinganamalla tanks, the country would be a complete desert. Firewood for Anantapúr, the Tahsildar says, is brought from hills far away north in the Gooty taluk."

451. Now that Anantapúr has been made the head-quarters of a district, the best plan seems to me to be to commence the formation of reserves on the hills which surround that place, and on the hills in the Anantapúr and Dharmavaram taluks which feed the streams by which the tanks of Anantapúr and Shinganamalla are filled.

A preliminary demarcation has been made, and the formation of a reserve has been sanctioned by Government on the range of hills which separates the taluks of Tadpatri and Anantapúr. An account of this forest will be found in paragraphs 3 to 11 of Colonel Beddome's report of the 30th March 1880. After my visit I submitted (on the 11th January) to the Collector a report, the substance of which, with a few modifications, is embodied in the following remarks :—

Proposed Muchukota Reserve.

452. The proposed reserve occupies a portion of the hill range, which extends from the Pennér river southwards. The rock is stratified; calcareous rocks alternating with red sand-stone. The nature of the rock explains the good growth on these hills of the *Hardwickia binata* (yépi or narépu), which is not found on the granite and gneiss hills in the vicinity of Anantapúr. The contrast between the green yépi forest, which clothes the lower slopes, chiefly on the east side of the range, and the other hills both east and west, which are perfectly bare, is most remarkable.

453. The distribution of *Hardwickia* on this range is not, however, uniform. The tree is abundant on the undulating ground which forms the outskirts of the hills on the east side, and over a large area of low hills in the centre of the reserve, between the cart-track which leads from Sanjivapuram to Venkatampalli and the high road from Anantapúr to Tadpatri, as well as north and south of these two roads. Further south yépi is scarce, but it re-appears, and is said to be abundant on the hills west of Kummanamalla village.

On the higher hills, and generally on the west side, the tree is scarce. Here *Anogeissus latifolia* (yellama) is common, and in places *Erythroxylon monogynum* (devadaru). The other shrubs associated with these species are of no importance. *Gymnosporia montana* (danti), *Rhus mysorensis*, and *Canthium parviflorum* (balasu)

are the most common. I also noted *Acacia Latronum*, *Carissa Carandas*, *Vitis pallida* (konda gumari), two species of *Randia*, the common one (manga) with small shining leaves and small green round fruit, and another (pedda manga) with broad, soft tomentose leaves, perhaps *Randia deccanensis*, Bedd., which is found in Kurnool. The Tahsildar thinks that the large quantity of yépi in certain places is mainly due to the care which the Reddi of Muchukóta and the Kurnam of Kummanamalla (at the south end of the proposed reserve) have taken of the forest in their village areas; but I saw quite as good forest, though less extensive, owing to the nature of the ground, in the village areas of Surapalli, Kadavakalla, and Dosaladu. So much is clear that during the last 10 to 12 years the tree has been fairly well protected. The yépi trees on the ground have nearly all sprung from coppice shoots, but they are 15 to 20 feet high, and though the majority of the stems have a girth under 24 inches, I saw a few trees above 3 feet in girth near the north-eastern edge of the proposed reserve.

454. The strata of the rock have a uniform strike, nearly north and south, with a very slight dip to the east. It thus happens that in places the hard strata of the rock are parallel to, and close under, the surface. In such places the yépi shows poor growth and cannot be expected to attain any large size. But, as a rule, there is no reason to apprehend that the trees will not grow to a good marketable size in this forest. They will certainly furnish wood large enough to be used for building carts and houses in this district; and this alone will be a very great advantage to the people living in the vicinity of the forest. At present, all the timber used in this taluk and in part of Anantapúr, which is not produced on village lands, is brought from the Nallamallai forest in the Kurnool District, which is 60 miles east of Tadpatri.

455. But, besides the supply of timber, these forests, if well taken care of, will eventually furnish an abundant supply of firewood, material for fencing the fields, and grass for cattle-fodder in seasons of drought when grass may not otherwise be procurable. I should also have expected that the improvement of these forests would have a beneficial effect in increasing the water-supply in wells for irrigating the fields in the valleys had I not noticed that, at least on the east side of the hills, there are very few wells in these valleys. The Tahsildar informs me that water is much too deep below the surface for wells to be profitably sunk in these places, and in one instance I saw a well near the foot of the hills which had been dug to a depth of 50 feet without success. This may perhaps be explained by the stratification of the rock. On the west, or Anantapúr side, however, there are wells in the valleys; and in any case the improved forest growth will have a beneficial effect in regulating the surface drainage, and in increasing the usefulness of the numerous bunds, which are built across small depressions in the valleys, in order to accumulate silt, to retain moisture, and thus to improve the fields above them. These results can, however, only be attained if, for a series of years, that area which it may be desired to demarcate as a reserved forest is absolutely protected against cutting and cattle, and if fires are excluded.

456. The area selected has been taken from the lands of three villages in the Anantapúr and six in the Tadpatri taluk. By far the larger area is situated in Tadpatri, and after the reserve has been finally sanctioned and demarcated, it is for consideration whether, in order to facilitate protection and management and to simplify the procedure in prosecuting offenders for damage done to the forests, the whole of the reserve should not be included in the Tadpatri taluk. This may be done by transferring the Anantapúr villages which adjoin the reserve to Tadpatri, or it may perhaps be done by excluding that portion of the reserve from the area of those villages.

457. The boundaries have been marked in a preliminary manner by heaps of stones white-washed with lime-water, and a line indicating the direction of the boundary has been chiselled on the nearest piece of rock near each mark. These boundary marks have everywhere been placed at quarter-mile distances apart. When permanent boundary marks are erected, it will be preferable to place a mark at each corner and wherever a road crosses the boundary line. The quarter-mile distance may be convenient in many cases, but it is far more important to have the

marks at corners and road crossings, and always to observe the rule that one boundary mark should, as far as possible, be visible from the next. If these suggestions are accepted, the distance between two marks will often be less than a quarter mile. As permanent boundary marks, I recommend in the present case either pillars 4 feet square, built up of stones without mortar, or upright slabs firmly let into the ground, similar to milestones, but not so elaborately finished. Each boundary mark should bear a serial number.

When the final demarcation is made, straight boundary lines must be adopted for as long distances as possible. This will greatly facilitate the protection and management of the reserve.

458. A sketch map of the proposed reserve, on the scale of 4 inches to the mile, has been prepared by the Revenue Survey Department. After the area has been finally demarcated, and after permanent boundary marks have been placed, an exact survey will doubtless be made, and on the map should be shown all cart-tracks and foot-paths, as well as the milestones on the high road, and such permanent structures as the guard-house on the top of the pass.

459. As far as I had time to examine the ground, it appeared to me that the boundaries of the north portion, north of the pass, called Koravanikonda, had been well chosen, and the area selected has a fairly compact shape. A considerable extent of good yépi forest has been excluded on the east side, but the Tahsildar informs me that this was necessary, in order to satisfy the requirements of the adjoining villages. Under the circumstances, the demarcation of this portion, which may be called the Muchukóta block, may be accepted; and after it has been constituted a reserved forest under the Act the boundaries should be made permanent.*

The southern portion, as at present proposed, is much cut up by stretches of culturable land in the valleys which have been excluded; and consequently I suggest that the final demarcation of this portion be delayed until some experience has been gained regarding the protection and management of the Muchukóta block. Some arrangement may perhaps be devised whereby the boundaries may be improved so as to facilitate protection and management. The south portion is situated in the village areas of Dosaladu, Cherlapalli, and Kummanamalla.

460. It seems right here to mention that, from a forest point of view, there is no objection to the existence of cultivated fields, as enclosures, in the reserve, provided their boundaries are clearly demarcated by separate boundary marks, though if they can be bought out matters are simplified and protection much facilitated. It should also be borne in mind that hills at present bare need not of necessity be excluded. If protected, such bare hills will certainly improve, and their inclusion will be beneficial, though they may not at present contain any forest of yépi. At present only one guard is entertained for the entire area. The Tahsildar thinks that, as a commencement, it will suffice to have two guards for the northern portion, after demarcation has been made permanent, and one guard for the southern portion, which, at the rate of Rs. 4 per mensem, will entail a monthly outlay of Rs. 12. Eventually it will be better to adopt a regular scale of pay for all Forest Guards that may have to be entertained in the Anantapúr District, so as to reward good services by promotion. In that case the average pay of Forest Guards should be higher than 4 rupees.

461. No revenue at all is at present realized from these forests. They are the favorite grazing ground for the cattle from the villages of the Tadpatri Taluk, but no payment whatever is made at present for pasture. After demarcation has been completed, and the area has been constituted a reserved forest under the Act, payment must of course be made for the grass produced in the reserve, and the Tahsildar is of opinion that the permission to cut grass in the demarcated area may be leased on condition that the forest is not fired. The grazing of cattle cannot

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* From a statement appended to the Collector's report of the 5th June 1882 it appears that the area, the reservation of which has been approved by Government, as well as the waste and forest allotted to those villages (four in Tadpatri, three in Anantapúr taluk), from which the land was taken, is as follows:—

	ACRES.
Land reserved	7,132
Land allotted to villages	4,811

The population is stated as 6,962 souls, the number of cattle 5,325, and that of sheep 7,890.

yet be permitted. Before that can be done, protection must have advanced much further. The cutting of grass, in the manner suggested, may be tried as an experiment, but it will be necessary at the same time to cut and burn fire-traces around the reserve.

This, however, must wait until the area has been permanently demarcated. It is a matter for regret that a commencement of fire protection cannot be made at once, for the trees are now full of seed, and an abundant crop of young growth would follow fire protection. The people of the locality maintain that the tree seeds regularly every year. I do not know how far this is correct, but in Berar, Nimár, and elsewhere *Hardwickia* generally seeds only once in three or four years.

Eventually a very considerable revenue may be realized from tha sale of wood and timber, but at the outset the expense of protection and management must be met by the sale of grass.

The wood which will be produced in this reserve will probably all be consumed locally, and to some extent it will replace the wood which is now brought from the Nallamallai forests to Tadpatri. Small wood, not fit for better use, may perhaps find a market as locomotive fuel, but the area is too small to justify the expectation that the supply to the railway from this reserve will be important.

Management of Reserves.

462. As regards the management of the reserves proposed to be demarcated in these two districts, protection will be the chief work for many years to come. Should it be found expedient to form reserves in the black cotton soil of the northern taluks, sowings of babul will doubtless be useful. In several places in the Anantapúr District I came across patches of babul sown by the ryots in land for which they pay assessment, and Government should stimulate the extension of such plantations by setting the example in establishing them on a large scale and in a systematic manner. I do not say that we can expect the same success as in the moister climate of the Poona District, where numerous babul forests have been created by the local Forest Officers on black soil in the vicinity of the Beema River. Cultural operations may also with advantage be undertaken on low ground near the Pennér and other rivers, if land can be made available for the purpose.

463. But on the dry hills, to which the preceding remarks chiefly relate, sowing and planting would, in the majority of cases at present, be out of place, and in any case should be preceded by strict protection continued during a series of years. As a preparatory measure, I recommend that when money can be made available a commencement be made to place dams of dry stone across ravines and small valleys. Behind these silt will accumulate, which will always be more or less moist, and such places should be stocked with suitable trees by sowing and planting. Trees which seed plentifully should be preferred. *Melia indica* (nim) is much grown near villages, and seems to thrive well. In many villages between Ráyadrug and Anantapúr I found that the wood of nim trees grown near villages was the chief wood used for building. Other trees which should be cultivated are *Zizyphus Jujuba*, which coppices readily, and on sandy soil *Ailanthus excelsa*. An experiment should be made to cultivate *Cassia auriculata* on a large scale. The bark is used for tanning, and there is a steady demand for it. Possibly the bush might be made to yield a crop several times a year.

464. In most reserves protection will at first be the main work, and this will be greatly facilitated by the selection of good boundary lines. In the vicinity of populous villages fences may often be necessary, and Forest Officers in these districts must regard it as their special duty to devise the best and most economical system of fences. In many cases dry walls of stone will be found to be the best kind. In Cuddapah, I understand, that they cost Rs. 2-10-0 a chain, or Rs. 210 a mile. In Merwara stone walls 18 inches thick and 3 feet high cost from Rs. 2-8-0 to Rs. 5 for 100 feet, say Rs. 3-8-0 on an average, corresponding to Rs. 185 per mile. Systematic and sustained efforts must be made to reduce their cost in these districts. In Ajmere live fences of thór (*Euphorbia Nivulia*) have succeeded well, and have been made at much less cost than stone walls. Attention is invited to paragraphs 13 and 14 of the report on Ajmere and Merwara of 1879. *Euphorbia Tirucalli*, fences of which are commonly planted around irrigated lands, requires good and

deep soil; but other species of fleshy *Euphorbia* are common on the stony hills of these districts, and an experiment in cultivating them for fences should be made.

465. As regards establishments, my advice is to proceed very gradually, and at the outset only to appoint Forest Guards. A graduated scale of Forest Guards should, however, at once be fixed, so as to give the men entertained definite prospects of promotion, without necessitating their transfer on promotion to another forest. This is necessary; and another essential point is, that each Guard must be responsible for a definite area, and be required to reside in it, or in its immediate vicinity. In the matter of fire protection an effort should be made to enlist the services of the village officers by the payment of annual rewards, payable after the end of the hot season, for the successful protection against fire of that portion of the forest; the protection of which has been assigned to them.

While in the district I suggested to the Conservator that the District Forest Officer should appoint Forest Guards as the demarcation of the forests progressed, and that he should at the outset correspond with them direct. In his letter to Government of the 18th March 1882, Major Campbell Walker accepts this suggestion. The establishment of ranges and the appointment of Foresters and Rangers to the charge of these ranges must wait until demarcation has made more progress, and until suitable persons for these posts become available.

At the outset, and possibly hereafter also, the District Forest Officer should, as much as possible, utilize the taluk establishments.

Land at the disposal of Government not included in these Reserves.

466. For the waste land at the disposal of Government, not included within reserved forests, rules will have to be made under Section 26 of the Forest Act. These rules should in these districts be made applicable to all unoccupied land at the disposal of Government. It has already been said that certain trees, such as teak, sandal, yépi and *Terminalia tomentosa*, must be declared reserved trees, and this, I presume, can be done under Section 26 (*c*).

The Collector of Bellary, Mr. H. P. Gordon, in his letter of the 30th January last, states that in some instances the jungles have been so exhausted that the roots of the trees are dug up, which precludes the possibility of reproduction of shoots from stools. Section 26 (*c*) gives the needful power to make a rule prohibiting the digging up of roots without special permission. Such a provision should be inserted in the rules made under this section for the Bellary District.

467. The Collector further states that the practice of burning the grass on the hills and waste land is very general, and is of course destructive of seedlings, trees, and shrubs, as well as, by destroying immense quantities of fodder, ruinous to the interests of cattle-owners, except where the grazing lands are very extensive. Rules regulating or prohibiting the kindling of fires, and prescribing the precautions to be taken to prevent the spreading of fires, can be made under Section 26; and in addition to this, Section 27 gives power to close against pasture land to which the rules have been extended, and which has been fired wilfully or negligently. These provisions will doubtless be found sufficient.

I agree, however, with what the Conservator states on this point in paragraph 19 of his letter of the 18th March last, that the practice of burning the hills is too universal to be put a stop to by a general rule all over the country. Such action, if unsuccessful, would do more harm than good. The point to be aimed at in the commencement is complete protection against fire of the tracts which may be declared reserved forests under the Act. Section 21 (*b*) is intended to compel adjoining proprietors to guard against the spread of fire from their lands into the reserved forest, and should this provision not be found sufficient, rules under Section 26 may be made for lands adjoining the reserved forests.

If the Collector thinks that an attempt can be made, with any reasonable prospect of success, to prohibit the firing of land at the disposal of Government on certain hill ranges, or in a tract of country otherwise defined, this may be done as an experiment on a limited area, but I would deprecate the attempt to make such prohibition general throughout the district.

Financial Prospects.

468. The following statement exhibits the receipts and charges on account of jungle conservancy in the former Bellary District. During the famine the whole of the jungles were thrown open, and it took some time before the collection of revenue was again fully organized :—

Years.	Receipts.	Charges inclusive of Establishments.
	RS.	RS.
1876-77	2,635	4,611
1877-78	1,092	3,716
1878-79	4,308	1,893
1879-80	2,255	2,361
1880-81	2,592	801
1881-82	12,622	2,187
Total ...	25,504	15,569

469. This revenue would not suffice to cover the outlay which the demarcation of reserves and other proposals made in this report will entail. But there are several sources of revenue which are capable of considerable development. In his letter of the 30th January last, the Collector states that up to 1870 seigniorage was levied upon fuel cut for sugar-boiling, but that it was stopped in 1871 in accordance with the orders of Government. Those orders (G.O., No. 27, dated the 6th January 1871) stated :—

"Ryots may have fuel free from unreserved tracts for *use*, but not for *sale*, and the Government are not disposed to curtail this privilege," and "it is desirable by all means to encourage such small industries, as the manufacture of indigo and sugar, by the growers."

By G.O., No. 1225, dated the 31st October 1873, those orders were confirmed in the following terms :—

"The Governor in Council is further of opinion that it is in accordance with immemorial usage to permit villagers to cut firewood free for the manufacture of the produce of their own lands."

470. I am disposed to think that as regards Bellary, and probably also as regards other districts, these orders should now be reconsidered. As a matter of fact, firewood used by the ryots for sugar-boiling and indigo manufacture pays seigniorage in North Arcot and in several other districts. In his letter already quoted, of 30th January last, the Collector strongly advocates the abolition of the privilege, and the charge of seigniorage on fuel cut for this purpose. He observes :—

"The number of persons who would be affected by the abolition of the privilege would be small, while the relief to the jungles would be great, for the measure would enforce economy in the use of firewood."

471. The Conservator states the consumption of fuel on account of this industry at the rate of sixty cart-loads per acre stocked with sugar-cane, and that the area under sugar-cane cultivation in the four western taluks is as follows :—

	ACRES.
Kúdligi	573
Hospet	4,098
Hadagalli	406
Harpanahalli	620
Total ...	5,697

But besides firewood, much refuse cane is used as fuel, and assuming with the Conservator that the consumption of firewood is only at the rate of 20 cart-loads per acre, this would give an annual drain on the jungles to the extent of 113,940 cart-loads, corresponding, at 6 annas for 1,000 lbs., to an annual revenue, if seigniorage were levied, of, say, about 35,000 rupees. The Conservator observes, with justice, that this wood is used free of charge by comparatively wealthy men pursuing a lucrative industry, while the effect of this liberality on the part of Government has been to exhaust the jungles, and to make it difficult for the poor man to procure fuel for his own use. As a matter of fact, there is very little wood left on the hills in British Territory, and much of the fuel used for sugar-boiling in the Hospet taluk comes from the Sandúr forests, and is paid for by the ryots.

472. Hitherto Government have not laid out any money in order to provide a permanent supply of firewood to the people, but the formation of the reserves now proposed will cost a good deal of money, and it would be a legitimate mode of covering this outlay by re-establishing the seigniorage on firewood used for sugar-boiling.

The result of this measure, if sanctioned, would not, however, be an annual revenue of Rs. 35,000. The Government forests and waste lands which furnish firewood for sugar-boiling in the Hospet taluk do not, I feel certain, yield anything like 80,000 cart-loads a year; but the advantage would be this, that needless waste would to some extent be stopped.

473. All over the rocky hills which extend north-east from Gudikóta, and which I saw on my visit to the iron-furnaces of Mahdapur, as well as on the hills in other parts of the Kúdligi taluk, are numerous tamarind trees,* apparently self-sown. The land, I was told, belongs to Government, but the produce of the trees has been enjoyed for a long time past by the Poligars of Gudikóta and Jaramali.

If the inquiry, which I understand has been commenced, shows that this user is based upon a right, such right must of course be scrupulously respected, and, if necessary, bought out, in case it should be decided to constitute any of these areas reserved forest under the Act.

But if it should be found that this user is based upon encroachment, there should be no hesitation in disallowing it. To allow such encroachments to continue would, I submit, be mistaken generosity on the part of Government, which would make the demarcation of reserved forests difficult, and diminish the revenue which s required to pay for forest protection in this district.

474. The Conservator, in paragraph 20 of his letter quoted, proposes the imposition of a light grazing fee for all cattle sent to pasture on Government waste lands. Whenever areas have been constituted reserved forests under the Act, any grass cut in those areas, and any pasture that may be permitted, must be paid for, and possibly it may be found expedient to charge for pasture in certain extensive forest tracts in the hills, though they may not have been demarcated, but I doubt whether it would be expedient to require payment for pasture on all Government land. On the other hand, I would suggest for consideration that at the settlement which is now in progress in these two districts no final orders be passed setting apart tracts for free grazing. This question should be dealt with when the demarcation of reserved forests is taken in hand.

Any additional revenue must chiefly come from the areas demarcated as reserved forests, but this revenue can only increase very gradually, as the majority of areas which will be reserved under the Act will require continued and strict protection before they can be expected to yield any considerable income. Hence the average gross revenue during the five years commencing with 1883-84 has been estimated at only Rs. 15,000 a year.

Except the Penukonda forests, the tracts which contain most wood are the leased Sandúr forests and the Muchukóta tract; but in both cases, whatever revenue may be realized from these tracts will be more than expended on the organization of forest administration, the rent for the leased forests, and the protection of these forests.

475. Upon the whole I can hold out no prospect of any surplus revenue from forest administration in these two districts during the next five years. The charge of the Bellary forests will require an experienced and specially selected officer of the superior staff, and the Anantapur District will also require a good officer. And the forest establishments, though they must, as explained, be entertained very cautiously, will yet cost a good deal of money, and besides these items there is the outlay on forest settlement, boundaries, and compensation.

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* With tamarind I found associated among these gneiss boulders, *Albizzia amara; Erythrina indica; Euphorbia antiquorum, Nivulia; Randia nutans, Grewia pilosa, Rothii, villosa; Diospyros Chloroxylon; Ulmus integrifolia; Wrightia tinctoria; Capparis Roxburghii; Niebuhria linearis.*

CHAPTER IX.

SALEM.

476. I reached Tirupatúr on the 11th January, where I met Mr. Cherry, the Officer engaged in the selection of reserves, and Mr. Stanbrough, the Forest Officer of the Salem District. In company with these two Officers, I went to Alangáyam at the foot of the Javádi hills on the 12th, where the Collector, Mr. H. E. Stokes, was in camp, and on our way we examined the lower slopes of the Yélagiri hills. On the 13th, we examined a large tract of low hills stocked with forest of *Premna tomentosa* and *Albizzia amara*, between Alangáyam and the north-eastern end of the Yélagiri hills (the proposed Nimayampatti reserve), and ascended to Náyakanúr, which is situated on the northern plateau of the Javádi hills. On the 14th, I visited the eastern part of the Javádi hills near the borders of North Arcot, and then went south to Kambakúdi, situated near the highest point of this hill range, the Kambakúdi hill, which we ascended on the 15th, and then went on to Pudúr, a cluster of populous Malaiáli villages situated in the centre of the southern table-land. From Pudúr we went to Singarapéttai on the 16th. The 17th was spent with Mr. Wooldridge in the Chinnasamudram reserve of the South Arcot District north-west of Chengam, and in the afternoon I examined the reserve near Singarapéttai. On the 18th, Major Campbell Walker, the Conservator, joined me; on the 19th, we reached Harúr and visited the reserve near that place; on the 20th, we reached Mallápuram on the Madras Railway line; and on the 21st, we inspected the reserves near the railway south of Mallápuram. The 22nd I was at Salem, visited the Shevaroy hills on 23rd, and proceeded to South Arcot through the Salem and Attúr valleys, reaching Attúr on 25th, and leaving the district on the 26th January.

Principal Forest Tracts.

477. The total area of the Salem District is estimated at 7,729 square miles, or 4,946,560 acres, which may be subdivided as follows:—

	ACRES.
Zemindari and Inam lands	1,390,912
Government lands occupied	977,867
Do. unoccupied	2,577,781
Total Area of the District ...	4,946,560

In 1871, before the famine, the population was nearly two millions, or 254 to the square mile. Much of the district is thinly inhabited, and a large proportion of the area is forest and waste. The forest area has been estimated at 2,251 square miles, and Colonel Beddome (paragraph 28 of report of December 1876) stated the average annual demand on the Government forests of the district, as far as reported, at 50,699 cubic feet of timber (7,379 cut departmentally, 33,298 cut on licenses and 10,022 cut on free passes) and 34,459 cart-loads of firewood, but added that doubtless much beyond this was illicitly cut and smuggled. This of course is an insignificant yield from so large an area. A portion only of this large area can be demarcated and permanently maintained as reserved forest, but there will be no difficulty, under good management, in securing permanently a yield many times larger than that here mentioned.

478. The district is mountainous and the forests are chiefly situated in the valleys and on the slopes and tops of the hill ranges, of which the following are the most important:—

1. The Javádis, greatest elevation 3,840 feet.
2. The Yélagiris, greatest elevation 4,440 feet.
3. The Shevaroys, Chitteri, Tenandemalai and Kalráyan hills and other ranges between the Ponnár river in the north, and the Salem-Attúr valley in the south, the highest point rising to 5,410 feet on the Shevaroys.

4. The hills in the south-eastern corner of the district, between the Salem-Attúr valley and the Cauvery, viz., the Bódamalai hills (4,000′), the Kollimalai hills (4,663′), and the Pachaimalai hills (3,358′), with numerous smaller outlying hills.
5. The large mass of hills, in what is commonly known as the Sub-division of the Salem District, comprising the taluks of Hosúr, Krishnagiri and Dharmapuri, between the Cauvery and Ponnár rivers, rising to 4,600 feet at Gutráyan. There is also a large extent of forest along the Cauvery river, on low undulating hills between Sankagiri near Erode, and Shólapádi at the junction of the Thópúr river with the Cauvery.
6. A large area of low undulating hills north-east of the Ponnár river in the Krishnagiri taluk.

Character of Forests.

479. As regards their constitution, it seems to me that as far as my rapid tour, the data kindly furnished me by Mr. Stanbrough, the District Forest Officer, and the study of Colonel Beddome's reports permitted me to judge, the following main classes of forests may be distinguished :—evergreen, the bamboo, the deciduous forest and the thorny scrub. The evergreen forests, which are found on most of the hill ranges at elevations above 3,000 feet and at lower elevations in moist valleys and deep ravines consist of a great variety of trees, among which may be mentioned *Eugenia Jambolana* (naga), several laurels, of which *Litsœa zeylanica* and *Tetranthera laurifolia* are the most important, *Mimusops Elengi*, *Cedrela Toona* and *Caryota urens*. Some of these evergreen forests are sacred and have thus been preserved. Instances are the Swami shola on the Yélagiris, the sacred grove at Pudúr on the Javádis, and several sacred forests on the Shevaroys.

480. The bamboo forests.—This class of forest covers very extensive areas, chiefly on the Javádis, the Shevaroys, the Chittéris, Arunútimalais, the Kalráyans, Kollimalais, Pachaimalais, and on the hills in the Hosúr and Dharmapuri taluks.

In these forests I have noticed three species of bamboos. That kind which covers the largest area is the small or male bamboo, *Dendrocalamus strictus*. The forest of this species is chiefly found on dry slopes up to an elevation of 3,000 feet. On the Javádis it is found not only on the outer slopes but also on the plateau in dry localities. This is the most useful bamboo, and it is exported either entire for building, or split, or made up into mats and baskets.

The thorny bamboo, *Bambusa arundinacea*, a much larger kind than that first mentioned, forms extensive forests on the plateau of the Javádis, where it chiefly occupies the bottom and lower sides of the valleys. A remarkable instance is the large bamboo forest at the head-waters of the two valleys, which, running in opposite directions, separate the eastern and western plateaus of these hills. Extensive forests of this species are also found at lower elevations in the valleys which descend from the Javádis and other hill ranges. This bamboo is always exported entire, it is not split or made into mats. There is a considerable export to the Eastern Coast, as well as to Bangalore and other large towns, but it is much less used than the small bamboo. The third species, which is as large as, but less thorny than *Bambusa arundinacea*, I have found (in leaf only) on the Javádis, and I am unable to identify it.

481. The deciduous forest which occupies large areas on the outer slopes of the hill ranges, mostly open, the ground covered with high grass between the trees or with the small bamboo instead of the grass. The principal trees in this class of forest are—

Anogeissus latifolia, *Chloroxylon Swietenia* (satinwood), *Terminalia tomentosa*, and at higher elevations *Terminalia paniculata*. Fires pass through this class of forest annually during the hot season. A remarkable feature in these deciduous forests is, that with the exception of a few useless kinds, such as *Boswellia thurifera*, *Sterculia urens* and *villosa*, *Dalbergia paniculata*, trees of large size are exceedingly rare. The following may be regarded as sub-classes of the open deciduous forest.

(*a.*) The forests of acha or *Hardwickia binata*. This tree is found here and there, mixed with other kinds but generally as the dominant tree, the forest being open, with a great deal of grass. *Hardwickia* is common in the forests of the Kóttaipatti valley between the Chittéris and the Kalráyans. These forests, being somewhat difficult of access, are still said to contain a proportion of large trees of this and other valuable kinds. There is also a considerable area of acha forest on the undulating hills near the Cauvery river. In his report of December 1876, Colonel Beddome states that up to that time they had been almost unworked as there had been little or no demand. The fact of its timber being very hard and difficult to work has done much to protect *Hardwickia* here as well as in other parts of India. Of this a remarkable instance are the Punassa forests on the banks of the Nerbudda river in Nimár.

(*b.*) The forests in which *Acacia Catechu* (karangáli) prevails. Such forests are found along the foot of the Javádis and in the Salem-Atúr valley. The tree is much prized for posts used to lift water from wells. For building, the wood at present produced in the forests is not generally sufficiently straight; but there is no reason why these Catechu forests, if protected against cutting and fires, and if the trees were permitted to grow up in compact masses, should not produce straight pieces for building purposes. No Catechu is made anywhere in the district.

(*c.*) The forests of *Albizzia amara* (turinji) and *Premna tomentosa* (podangi nari). These trees, more or less mixed with other species, cover large areas on undulating ground and low hills, but do not ascend to any great elevation. The forests of these trees however are exceedingly valuable for the supply of fuel to towns and railways.

482. The thorny scrub, consisting chiefly of *Acacia leucophlœa*, *Latronum*, *Catechu*, *Dichrostachys cinerea*, *Canthium parviflorum*, *Randia nutans* with *Erythroxylon monogynum*, and a number of evergreen trees, such as *Strychnos Nux-vomica*, and *Strychnos potatorum*. This scrub occupies large areas at the foot of the hills and is found on waste lands throughout the district. In many places a gradual transition from this thorny scrub into high deciduous forest may be noticed, and in such cases the chief trees which indicate the change are *Albizzia amara*, *Albizzia Lebbek*, *Melia indica*, *Wrightia tinctoria*, and *Grewia vestita*.

The four great classes of forest which have here been described cannot always be sharply separated, and there is often a gradual transition from one into the other.

Useful Trees and Shrubs.

483. It will now be well to mention some of the most important trees and shrubs which are found in these forests :—

Sandalwood, *Santalum album* (chendanam), is common in bamboo and other forests on all hill ranges above 2,000 feet, but is wanting in the dense evergreen forest. It is also found on the hills, in fields, in hedges, and on waste land. As far as I have been able to see, it has been fairly well protected, and thefts of sandalwood are said to be rare.

Teak, *Tectona grandis* (teka), is exceedingly scarce at present. As an instance, I may mention that all teak timber used at Salem is either brought from the Western Coast or from Burma. We found a large number of stumps of teak, eighteen inches to two feet in diameter, in the forest below Kambakúdi, at an elevation of 3,000 feet, and stumps of the same size are commonly found on all hill ranges at similar elevations. Teak saplings are also found scattered here and there, but when accessible they are much cut and hacked; and during my wanderings in the forests of this district I have come across very few straight and well-grown saplings of that tree. It is clear that teak has not in this district received the same protection as sandalwood.

Pterocarpus Marsupium (vengay) is found all over the hills, and Mr. Stanbrough informs me that it is particularly common in that portion of the Kollimalais which is in the Attúr taluk. I am also informed that large timber of this species is still

found in the Kóttaipatti valley and in the Sub-division. The wood is chiefly in demand for the framework of carts and for beams of houses, and I have been informed that at the Thamampatti depôt, in the Attúr taluk, scantlings of vengay fetch Rs. 2-5-0 per cubic foot.

The gallnut, *Terminalia Chebula* (kadukai), is found on most hill ranges above 2,000 feet. The nuts are collected on account of the Department and sold at depôts. I am told that they fetch from Rs. 6-8-0 to Rs. 7-0-0 per maund of 80 lbs. There is competition, as large quantities are collected by traders, mostly Chetties, in the Government forests, as well as in the private forests on the Kalráyan hills.

Acacia leucophlœa (vel-vélam) is common on waste land and in the thorny scrub at the foot of the hills. Large specimens, which show the characteristic rust-brown color of the bark, are found here and there on the hills and in such reserves as have been protected for some time. The bark is used in the distillation of arrack, and it is collected on payment of seigniorage which amounts to five rupees a cart-load.

Cassia auriculata (avaram) is common on waste lands in the open country. The bark is exported to the East Coast, and is used on a large scale in the tanneries at Salem town. The seigniorage is Rs. 2 per cart-load.

The tamarind is commonly found in the forests of most hill ranges in this district, particularly in the Maharajagarh forests in the Krishnagiri taluk, on the slopes of the Javádis in the Tirupatúr taluk, and at the foot of the Kollimalais in the Námakal taluk. The collection of the fruit is leased out to contractors annually and a large revenue therefrom is realised in the three taluks mentioned. There seems no doubt that the tree is indigenous in the forests of this district.

Sandal and teak will probably be reserved under the Act throughout the Presidency, and it will have to be considered what trees should be added to them for the Salem District. At the outset I would suggest that a few kinds only be added. *Hardwickia binata*, *Pterocarpus Marsupium*, *Terminalia Chebula* and the tamarind might perhaps be selected. The supply of other valuable timber, such as *Acacia Catechu* and *Terminalia tomentosa*, which are more widely spread, can be maintained by constituting tracts, in which they are found, as reserved forests.

Denuded Hills.

484. Speaking broadly it may be said that the Salem District is fairly well wooded, and that extensive tracts of bare hills are not common. There are, however, considerable areas which have been completely denuded, and the following may be mentioned as instances :—

(1.) The hills in the immediate vicinity of Salem town, excepting the slopes of the Shevaroys which have been partially protected.

(2.) The hills which surround the rich valley of Gházipúr, viz., the southern slopes of the Bódamalai range, the extreme north-west of the Kollimalai hills and the Vella Kurdu hills. The denudation is ascribed to the requirements of the thickly-inhabited country at their foot, as well as to the old established iron-smelting furnaces in that locality.

(3.) The extreme south end of the Kollimalais and the Thalaimalai hills, between the Kollimalais and the Cauvery river. The reason of this is the extensive manufacture of iron fron the Thalaimalai ore, and the vicinity of the fertile and well-watered valley of the Cauvery.

(4.) The lower hills on both sides of the Attúr valley, denuded partly by the wood consumption in this fertile tract, partly by iron-smelting furnaces.

Here it should be mentioned that some of the hills in the vicinity of the railway line, which are private property, such as the hills in the Kadatúr mitta in the Uttankarai taluk, have been almost completely denuded through indiscriminate cutting for railway fuel. And adjoining the north of the Salem District are the hills of the Kangundi Zemindari in North Arcot, on both sides of the Bangalore branch, which have also been cleared of all forest.

485. The existence of forests on the hills of the Sub-division and along the eastern border of the district must mainly be ascribed to insufficient demand for wood and bamboos. The chief use of a large portion of these forests at present is,

to furnish pasture during the hot season to the cattle of the open country along the East Coast and of the Salem District. The scarcity of large trees of the more useful kinds does, it is true, indicate the existence of a certain demand for timber before conservancy was established, but much of this was temporary, during the construction of the railways. At that time all large trees in accessible places, likely to be used, were cut wholesale, and what timber was left lying in the forest was destroyed by the annual jungle fires.

Good Results of Conservancy.

486. The demand for wood and bamboos at the present time is very small, and to this must be ascribed the existence of forests on the Javádis and other hill ranges. There are, however, some forests which owe their present good condition to the operations of forest conservancy. Apart from the demarcated reserves I here advert to certain tracts on the Yélagiris and Javádis and to the forests on the slopes of the Shevaroys in the vicinity of Salem and of the railway line. The good effect of conservancy may also be seen on the south slopes of the Kalráyans which overhang the town of Attúr. In this case the good work already done by protection may have important results, on account of the iron beds near Aviarmalai and at the southern foot of the Attúr hill, noticed by Messrs. King and Foote in their paper on the geology of this district.

Future Policy.

487. In considering the future policy to be followed in the forest administration of this district, I will assume that it is intended to select and demarcate a certain proportion of the Government forest area as reserved forests, which shall always be maintained as such, and which shall be protected and improved to the utmost. The practical objects of this measure may be stated to be—

First.—To secure a permanent supply of timber, bamboos, and fuel for towns and the open country, as well as for the railway and wood-consuming industries, such as iron-smelting and sugar-boiling.

Second.—The protection of the hill sides against denudation, and the maintenance and improvement of the water-supply in springs, streams and wells. Many of the streams rising in the Salem District, or deriving part of their water-supply from the hills of that district, are important for irrigation in a small way. As instances, I may mention the Ponnár river which rises in Mysore, but receives numerous affluents from the hills of this district, and the Vellár, which is fed from the hills on both sides of the Attúr valley. There are numerous bunds and anicuts across these rivers, but they, as well as the bridges which span these streams, are often breached or carried away by floods, which certainly would be less destructive if a larger portion of the hills whence they take their rise were covered with dense, well-stocked forest.

In some instances the Government forests in the Salem District will doubtless be found useful in supplying cattle-fodder, particularly during seasons of drought. In the Dharmapuri taluk, which unfortunately I was not able to visit, I am told that the chief wealth of the people is their cattle which are of a very fine breed. They supply Trichinopoly and Tanjore with their best cows and bullocks.

Reserves to ensure the Supply of Fuel to the Madras Railway.

488. The only reserves which have been finally sanctioned and demarcated in this district have, with the exception of a small area of evergreen forest of 94 acres on the Shevaroys, called the monkey shola, been formed with the view of providing fuel for the railway. The aggregate area of the old reserves is 12,618 acres, according to the latest measurements available, while an additional area, estimated at 6,000 acres, has been sanctioned south of the Shevaroy hills station, but not yet been demarcated.

Unfortunately most of these are on poor soil, and considering this, as well as the character of the forest growth, the yield of fuel from these areas will, I fear, be extremely small. Taking into account the fuel resources in other districts

through which the line runs, I have come to the conclusion that every effort must be made, as soon as possible to demarcate and place under complete protection in this district an aggregate area of 50,000 acres within a moderate distance from the line. I do not advocate the abandonment of any of the existing reserves, though some of them are extremely poor, but the additions should comprise as large an area of good land, suitable for the production of forest growth, as possible.

It will be convenient to indicate briefly the localities in which it appears probable that additional reserves can be formed.

I understand that from eight to ten miles, according to the facilities of carriage, is the greatest distance over which fuel can be carried to the line at the rates paid at present by the Railway, which in this district, I am informed, range from Rs. 4-6-0 to Rs. 5 per ton of 2,240 lbs. I may here mention that the Railway accept 68 cubic feet of stacked wood as equivalent to a ton. Assuming that sixty-eight cubic feet stacked correspond to forty cubic feet of solid wood, this would give 56 lbs. as the weight per cubic foot, which obviously can only be the average of green wood of the kinds chiefly in use. The following is a list of the principal species, with their local names, which I found in the fuel stacks at Mallápuram station, and which are used for railway fuel in the Salem District :—

Albizzia amara	turinji.
Premna tomentosa	podangi nari.
Cassia Fistula	konai.
Bauhinia racemosa	chit acha.
Diospyros sp. (Stem fluted, bark smooth grey) ...	vakana
Canthium didymum	nekanay.
Elæodendron Roxburghii	khiri.
Grewia (Inner bark red, outer bark with long seams, rough plates, light grey)	udapai.
Alangium Lamarckii	alingi.
Erythroxylon monogynum	semlichan.
Dalbergia (Bark grey, fibrous.)	erivadi.
Lebidieropsis orbicularis	otai.
Strychnos potatorum	silla.
Strychnos Nux-vomica	yetti.

In addition to these, Colonel Beddome mentions *Wrightia tinctoria*, *Chloroxylon Swietenia*, *Zizyphus glabrata* (kur katura), *Dichrostachys cinerea*, *Acacia leucophlœa* *Albizzia odoratissima*, *Lebbek*, *Capparis pyrifolia*, *Pongamia glabra*, all of which grow in the reserves, though I did not find them in the fuel stacks at Mallápuram station.

489. The following suggestions are partly based upon data furnished me by Mr. A. W. C. Stanbrough, the Forest Officer of the Salem District :—

1. Near the Bangalore branch the Pudúr and Bargúr reserves, two small blocks on low hills, poor red sandy soil, about one-half thorny scrub and one-half forest, in which *Premna*, *Abbizzia amara*, *Wrightia tinctoria* and satinwood are the principal trees. Existing area 1,291 acres: may be extended to 4,000 acres.
2. The Nimayampatti reserve six to ten miles east of Vániyambádi railway station. This locality I examined in company with the local officers, and at the time strongly urged upon them its formation as a reserve. It is believed that an area of 8,000 acres may here be obtained. The forest consists chiefly of *Premna* and *Albizzia amara* on low hills north-east and east of the Yélagiris, on both sides of the Vániyambádi-Alangáyam and the Tirupatúr-Alangáyam road. Most of it was cut over twelve years ago, and, though it had not been protected against fire, the growth is fair, the quantity of railway fuel on the ground being estimated by Mr. Stanbrough at 2½ tons per acre, which would give a mean annual yield of ¼th of a ton per acre. The locality is comparatively moist and favorable, being in a valley four miles wide and surrounded by the Yélagiris, the Javádis, and the hills in North Arcot. Under fire protection, soil and forest growth would improve, and a much better yield may hereafter be expected.

3. The Singárapéttai reserve, near the village of that name, comprising the existing reserve (area 2,624 acres) outside the Javádis, stocked with thorny scrub, with much *Acacia Catechu*, satinwood, *Albizzia amara* and *Premna tomentosa*, as well as the lower part of the Mel-tirupatúr valley, which descends from the Javádis, and the outer slopes of these hills, of which, say, 1,400 acres may be available for the railway supply, making the total area that might be demarcated at this place 4,000 acres.
4. The Uttankarai reserve (two small pieces aggregating 469 acres) on poor stony soil, chiefly with thorny scrub. Much better land is, I am informed, available between Uttankarai and the Ponnár river, which might be added.
5. The Harúr reserve (1,177 acres) on poor dry soil, mostly thin thorny scrub, which the annual fires have not permitted to improve, with some better stocked forest in narrow stretches of low and moist ground. Further south there is a large extent of scrub of much better growth, extending to the boundaries of the Kadatúr mitta, a portion of which might perhaps be selected. An attempt should be made to obtain an aggregate area of 10,000 acres near Uttankarai and Harúr, but it is doubtful whether this will be possible.
6. The reserves west of the Shevaroys, above and below the Attúr ghât, on both sides of the railway, viz. :—
   (*a.*) The Mallápuram or C. reserve, formed in 1866, 587 acres, on poor soil much impregnated with salt in places ; thorny scrub, chiefly *Acacia Latronum*, with some planted babul which has come up well, and numerous saplings of nim, *Melia indica*, partly spontaneous partly planted, coming out of the thorns. Two inspection paths have been laid through this reserve dividing it into four blocks; a few more paths should be cut, so as to subdivide the reserve into a larger number of blocks. The guard who is in charge of this reserve might usefully employ his time by dibbling in nim seed successively in one block after another. Colonel Beddome (paragraph 18 of report, dated the 22nd December 1876) reports that 100 acres of this reserve had been planted and replanted several times with babul, nim and *Cassia florida*, but that it had been a miserable failure.
   (*b.*) The B. or Morúr reserve (1866), 799 acres, a narrow belt west of the line, extending from the railway to the crest of the hills, the level portion improving chiefly by the growth of *Acacia Catechu* seedlings, but large areas still covered with grass which is burnt annually: only here and there patches of dense growth of saplings and trees where the fire does no damage. Unfortunately an extensive cutting was made this season, extending over 100 acres, and the tops and branches of the trees, unless removed, will greatly increase the violence of the fires. When examining this reserve, I urged upon the Conservator and the local officers the necessity of making every effort at once to protect it against fire which is generally caused by sparks from the engines. A broad fire trace along the railway and a number of transverse fire traces should be burnt.
   (*c.*) The Varigampatti or A. reserve (1866), occupying the slopes of the Attúr ghât on both sides of the line, 1,976 acres. On the west side the soil is poor, but the growth has improved, and it is now a tangled mass of thorns, out of which, under protection against fire, eventually a good forest may grow up. On the east side of the line, where the reserve extends up the slopes of the hill, the soil is better.
   (*d.*) Kariappakombai (1873), three miles to the east of the line in a valley of the Shevaroys, 532 acres, said to be improving.
   (*e.*) Pillapally (1873), a small valley east of the Shevaroy hills station, 981 acres, said to be well stocked.

(*f.*) Ammanari (1872), 3 miles west of the line, 253 acres.
(*g.*) Kanjéri (1880), south of the Shevaroy hills station, between the line and the hills, 1,929 acres (the area entered on the Madras Survey map; Colonel Beddome, in his report of 26th December 1879, calls it about 4,000 acres).

Besides these, two new blocks, supposed to aggregate about 6,000 acres, on the low hills south of the Shevaroy hills station, have been sanctioned, but have not yet been demarcated on the ground. After demarcation and survey the area will, I fear, be found to be much less.

490. It is most unfortunate that the existing reserves were selected in a number of small detached blocks, and that in many cases the soil is not good nor the situation favorable. After examining the ground and discussing the matter with the local officers, I have come to the conclusion that every effort should be made to secure, as far as possible, all the valleys which descend from the Shevaroys towards the railway. The ridges between the valleys may, if necessary, be excluded as grazing grounds, but of the valleys as large an area as possible should be secured. Some of these valleys have, I am informed, already been included within the additional areas lately selected by Mr. Cherry, and it seems probable that an aggregate area of about 20,000 acres can be secured for railway supply on this side of the Shevaroy hills. It will probably be found desirable to make experimental plantations of *Grevillea robusta* and other fast-growing Australian trees on the Shevaroys, in order to determine whether a larger supply of fuel to the railway can in this manner be secured. The needful land for such plantations should be secured at an early date. There are extensive forest lands at the foot of the Tópúr hills west of the line from which the town of Salem is supplied with fuel, though the distance is twenty-four miles. They are about twelve to fifteen miles distant from the Shevaroy hills station, but it is supposed by the local officers that this distance is too great for the carriage of railway fuel. It seems, however, worthy of consideration whether a reserve should not be formed in that locality. There are no woodlands near the line at the disposal of Government in the Salem District further south, nor are there any west of the line between Mallápuram and Jalárpet. Besides the tracts here indicated, it may be considered whether there are any suitable areas at the disposal of Government (much of the land here is private) at the foot of the Javádis on the west side between Singárapéttai and Andiappanúr. The difficulty is, that at present there are no direct roads from the foot of the hills across to the railway line. It is for consideration, whether a tramway should not be built to the foot of the Javádis from Tirupatúr, in order to utilize the wood growing on these hills.

491. To recapitulate, according to the information which I have been able to collect on the subject, the only Government lands likely to be available for the fuel supply of the railway in the Salem District within a reasonable distance from the line are the following, and it is very doubtful whether the whole of this area can be obtained :—

Locality.	Sanctioned Area.	Total Proposed Area.
	ACRES.	ACRES.
1. Near the Bangalore branch ..	1,291	4,000
2. Nimayampatti	..	8,000
3. Singárapéttai	2,624	4,000
4. Uttankarai	469	10,000
5. Harúr	1,177	
6. Shevaroys, old reserves ..	7,057	20,000
Do. new, sanctioned, but not demarcated.	6,000	
Total ..	18,618	46,000

These railway fuel reserves as they stand at present are of very little use. The protection of such small areas at a moderate cost is impossible, and any systematic working is out of the question. Those which have been demarcated have all been surveyed, and special maps on the scale of 2 inches to the mile have been

published. It is to be regretted that this labor and outlay has been incurred on these small patches. What must be done, and that without delay, is to convert these small patches into manageable blocks by increasing their area wherever additions are possible.

The work is of great importance, and I submit that a competent Forest Officer should be employed on it at once. After these areas have been constituted reserved forests under the Act and demarcated, they must, in the first instance, be protected against fire and other damage, and no cuttings must be attempted until fire protection has been firmly established. I would not object to cautious thinnings in some of the moister valleys of the Shevaroy hills which can be protected against fire without much difficulty, but such cuttings as have lately been made in the reserves near the railway line must on no account be repeated. The effect of such operations is to increase the violence of the fires, to make the regeneration of the forest impossible, and to undo all the good that had been effected by protection continued for more than ten years. The first object must be to convert these tracts into fairly well-stocked forests, firmly to establish a good system of fire protection, and when this has been accomplished, systematic cutting in the best stocked and best protected portions of these forests may commence.

Colonel Beddome has expressed very correct views regarding the treatment of these reserves. Thus, in his report of the 22nd December 1876, he writes:—

"The late Acting Forest Officer of the Division has lately allowed cattle in, as they eat down the grass and render the tracts less liable to fire: this is, of course, a cheap way of escaping from fire; but the proper way is 'fire tracing,' for as long as cattle have the run of these tracts, seedlings cannot make much head even in the most favorable weather, and the bare places may never be filled up, nor other tracts brought to the required density; when this is accomplished, cattle can be allowed in periodically."

It is to be regretted that these excellent views have not been acted upon.

492. No reliable estimate can be framed regarding the future yield of these reserves, but it will be useful to put together the outturn of the cuttings hitherto made as far as I have been able to obtain reliable data.

In the Varigampatti or A. reserve, which was taken up in 1866-67, and since then partially protected, 886 acres have been felled between 1875 and 1879, with an outturn of 2,255 tons of engine fuel or 2·5 tons per acre.

In the Morúr or B. reserve, taken up in 1866, 100 acres were cut over in 1882 with an outturn of 384 tons or 3·8 tons per acre.

In these cuttings some trees for seed and all small brushwood have generally been left on the ground, and what is styled "engine fuel" comprises only pieces above three inches in diameter, so that the figures here quoted do not represent the entire outturn of the areas cut over.

Colonel Beddome, in paragraph 16 of his report of the 22nd December 1876, estimated that if fire and cattle were excluded, the outturn would be thirty tons per acre for a growth fifteen years old, corresponding to an annual yield of two tons per acre. This, as observed by Government in their orders passed at the time, was an arbitrary estimate. The growth in none of the reserves visited by me has come up to anything like this figure, but then it must be remembered that the first condition of Colonel Beddome's estimate, complete protection, has not been fulfilled.

The result however is, that owing to incomplete protection, no data have as yet been obtained whereupon to fix a reliable estimate of the yield that may be expected from these areas. The proposal here submitted, that an aggregate area of 50,000 acres be selected and demarcated, is necessarily arbitrary. If the selection is skilfully made, and if protection is effective, a yield like that estimated in the Nimayampatti tract at the foot of the Yélagiris may be hoped for, and in that case 10,000 tons a year may be obtained from this area. A larger yield we are not justified in expecting. Regarding the financial results of this undertaking no estimates can be formed, for no data are available, whereupon to base such an estimate. The proposal is submitted, because it is necessary to provide for a certain quantity of railway fuel from the Government forests of this district, but not as a revenue speculation.

Fuel-supply to the Town of Salem.

493. There is little chance that the annual production of wood on 46,000 acres of reserved forest in the Salem District (if so large an area can be obtained)

will exceed the requirements of the railway, but should this be the case, the wood produced will find a ready sale in the towns and large villages in the district.

The officer deputed to select the railway fuel reserves should pay particular attention to this point, and he should be specially charged with the selection of reserved forests, to ensure a permanent supply for the town of Salem.

The present fuel supply of Salem is derived from the following sources :—

(1.) The Tópúr forests in the Dharmapuri taluk, distance 24 miles; the wood is all brought in on carts. These forests are only about twelve to fifteen miles distant from the railway.

(2.) The Government forests on the southern slopes of the Shevaroys, whence it is mostly brought in head-loads.

(3.) The Government forests adjacent to the Manjavádi pass; the wood mostly brought in on carts, a distance of about twelve miles.

(4.) The Government forests on the Bódamalai hills; the wood mostly brought in head-loads.

(5.) The private jungles of the Salem mittah, on the Jerugumalais; brought in as head-loads, which pay to the proprietor from one pie to four pies, according to the description of the wood.

It is estimated that of the total quantity of fuel brought into Salem three-fourths are brought from Government forests, and the rest from private lands. The price is said to fluctuate from Rs. 3-8-0 to Rs. 4-0-0 for a cart-load of 900 lbs. This is not very high, but it is nearly double the rate paid by the Railway, and, as already mentioned, many of the hills in the vicinity of the town have been denuded, and the price will doubtless rise.

494. Something ought to be done to place the fuel supply of Salem upon a satisfactory footing, and the only practicable course to follow is, to demarcate a certain area and to protect and improve it, so as to raise up a compact, well-stocked forest, capable of supplying the town and the open country in the vicinity. That the forest improves by protection is shown by the satisfactory condition of the forest on both sides of the road leading up to the Shevaroys. Had these slopes been protected against fire as they have been against cutting, the results would have been still more satisfactory. Attention should, as a matter of course, be paid to the selection of good soil and favorable position, if possible in valleys sheltered against evaporation. Besides firewood, bamboos and timber would be produced in such forests which would yield a larger revenue than fuel. I have not been able to obtain an estimate of the annual consumption of the town of Salem, but considering all circumstances, it seems probable that a few well-stocked forest blocks, aggregating say 10,000 acres in the vicinity of Salem, would not be too large for the requirements of the town, and it would be a great boon to the people. The fuel trade would be concentrated, and, instead of wandering about over vast areas, the people would bring in the fuel from a few places where it would be cut and stacked for them by the officers in charge of the forest. I submit that this idea should be carried out, and in this case one block might be formed in the valleys coming from the south face of the Shevaroys, another on the north side of the Bódamalais, and a third on the low hills east and south-east of the Jerugumalais. The produce of these blocks would be also available for the railway just as the produce of some of the reserves formed originally for the supply of the line might find their way into Salem. The idea that the produce of certain areas shall only be used for a certain definite purpose is impracticable; such matters must settle themselves by the requirements of the consumers of wood, bamboo and fuel.

495. Another plan has been suggested, viz., to establish a system of rotation, and so to regulate the working of the different tracts which are now drawn upon for the supply of the town, as to limit the cuttings to the quantity which each tract is capable of producing. This scheme sounds well, but it is certain to lead to disappointment. The blocks temporarily closed would have to be protected, and the cuttings in the open blocks would have to be controlled. Operations would necessarily be spread over a large area, and it would be impossible to establish effective protection of the closed, and effective control of operations in the open, blocks. Under existing circumstances the tracts whence Salem is supplied with fuel are deteriorating year after year through cutting, grazing, and the annual fires, and

unless an extravagant outlay were incurred, matters would not improve under the system of rotation.

Assuming it was possible to determine the annual yield which may be cut in each tract in its present condition without impairing its productive powers, that quantity would become less, year after year, under the steady progress of deterioration to which the forest would be exposed. This plan is impracticable and the only measure which can be expected permanently to provide for the supply of the town, is to set apart and to improve to the utmost a well-selected limited forest area, and until its condition has improved sufficiently to justify its working, to permit the supply to be drawn from the remaining area.

If it should be apprehended that the temporary closing of 10,000 acres will be felt as too great an inconvenience, then a smaller area must be taken in hand in the first instance, and the benefit which will be derived from its protection will doubtless eventually lead to the carrying out of the measure to the full extent necessary to accomplish the object contemplated. Some inconvenience will doubtless be felt, but this inconvenience will be better than a total failure of the fuel supply which otherwise may not be far distant.

Reserves to provide Fuel for Iron-smelting.

496. Fully as important as the supply of fuel to the railway and to towns is the provision of an abundant and permanent supply of wood for charcoal in order to maintain the existing iron industry and, if possible, to enable it to develop on a larger scale. The magnetic iron beds of the Salem District are well known and they have been fully described by Messrs. King and Foote of the Geological Survey.

The iron beds of the Kanjumalai hill, 6 miles west-south-west of Salem town furnished the ore smelted by the Porto Novo Iron Company's furnaces at Pulampatti on the Cauvery river, and they still supply native furnaces in the villages around.

The Godumalai hill and the Singipatti hills, the former north and the latter south of the road which leads from Salem to Attúr, contain large masses of ore which gives employment to numerous furnaces in the villages at their foot.

In the Kollimalais and Thalaimalais, the southernmost hills of the Salem District, the magnetic iron beds spread over a very wide space, and they furnish the ore to numerous furnaces in the villages of the Námakal taluk.

The Thîrthamalai hill, north-east of Harúr, which forms a prominent feature in the country between the Javádis and the hills south of the Ponniár river, consists to a great extent of iron beds which, as Mr. Bruce Foote says, are practically inexhaustible. The ore is highly esteemed and there are numerous furnaces in the vicinity.

497. The Tahsildars of the taluks informed me, that there are in Attúr ten villages which smelt iron, and thirty-three in Salem, and there are furnaces also in the Námakal and Uttankarai taluks. But the industry has much diminished, partly through the improved communications, which have greatly promoted the consumption of cheap English iron, partly, and in places mainly, through the growing scarcity of fuel. Yet for many purposes the native iron is preferred and it seems right to consider what can be done in order to maintain and develop this industry. The chief measure which Government can take in this matter is to increase the supply of fuel by forming reserved forests and by protecting and improving them. It may be objected that to close the tracts whence hitherto the charcoal has been brought, would extinguish the industry instead of promoting it. But the measure must be carried out with judgment. Until the reserved forests are sufficiently advanced to be worked regularly, portions must be left open for the use of the iron smelters.

Although the hills in the vicinity of most iron-smelting tracts have become much denuded, yet there are some localities very favorable for forest growth, such as the Kottaipatti valley, south-east of the Thîrthamalai hill, and the slopes of the Godumalai hill. The Kollimalais I have not seen. The plateau, I understand, is much denuded and the slopes are steep and barren. But an attempt should be made to form reserves and to improve them.

498. I cannot undertake in this report to indicate either the extent or the position of the reserved forests which must be constituted to produce fuel for iron-making. This is a matter which must be studied on the spot in detail and which must depend upon the conclusions that will be formed regarding the extent to which it may be expected that this industry will grow. The aim should be to produce sufficient fuel, in the first instance, for maintaining the existing native industry, and in the second instance for making it possible eventually to establish works on a larger scale. If works are established on a large scale, the blast furnaces will have to be erected in the immediate vicinity of the forest, for ore can be carried more easily than charcoal. To the works at Pulampatti the ore had to be carried from twenty-three to twenty-five miles, and it may perhaps be found possible to smelt the Thîrthamalai ore at Singárapéttai at the foot of the Javádis twelve miles distant. Indeed it seems not impossible that iron ores may be found in the southern part of the Javádis. These are matters which must be settled after patient enquiry in detail on the spot, and in this enquiry an Officer of the Geological Survey or Metallurgist, with practical experience in iron-making with charcoal, must be associated with the Forest Officer.

I will assume that three suitable localities are found in the forest reserves, proposed to be established for this purpose, sufficiently healthy at all seasons of the year, and otherwise conveniently situated. I will also assume that it is decided to provide sufficient charcoal near each place to enable each work to turn out 10,000 tons of finished iron a year, requiring, say, 35,000 tons of charcoal,* which, with proper arrangements, should be the outturn of 140,000 tons of wood. In that case the probable yield of wood, producing charcoal fit for iron-smelting, in the forests proposed to be formed after they had been made dense and compact by continuous protection must be considered, and this, the most important factor in this case, will be found to vary exceedingly. At the bottom of the moist valleys of the Javádis, with good soil, and easily protected from fire, it is possible that an annual yield of two tons per acre might be attained; while on the dry and often rocky slopes of the hills which enclose these valleys, the annual yield will probably not amount to more than one-fifth of a ton, which is the amount at present estimated for the forest reserves in the vicinity of the railway line in the Salem District.

In the Kóttaipatti valley and in other valleys among the hills, the yield would be much heavier, but most of these localities are exceedingly feverish and will on that account probably not be found suitable for the establishment of high furnaces. Assuming that the soil and other circumstances justified the expectation that after protection from fire has been firmly established the average annual yield in the tracts selected would be half a ton per acre, each of these three works would require a forest in its immediate vicinity of 280,000 acres or 437 square miles. This is a very large area, and I much doubt whether there is a single locality near any of the Salem iron mines, where so large a forest could be formed.

499. It may perhaps be found profitable to manufacture pig-iron only in the forest and either to sell it, or to send it for conversion into finished iron to a locality where fuel is cheaper and more easily procurable.

English as well as Indian coal on the coast even at the lowest rates, Rs. 17 a ton, is out of the question, and under existing circumstances the produce of the Casuarina plantations would not be cheaper. These plantations if made on the coast in South Arcot, Chingleput or Nellore, are estimated to produce an annual yield of from two to six tons per acre, but at present the wood finds a ready market in most places at from Rs. 5 to Rs. 7 a ton, which rates are of course prohibitive. Prices may however be expected to fall as the area of these plantations is extended and the younger plantations come into bearing. There are also the blue-gum plantations on the Nílgiris the best of which, at their present age, produce about twelve tons per acre annually if completely stocked, so that, taking good and bad, they may probably be relied upon to produce at the rate of six tons per acre on an average. These blue-gum plantations might be increased to a large extent on the plateau of the

* Dr. Warth, in a paper on the charcoal-iron industry in India, published in 1881, states that 319 lbs. of charcoal are required for manufacturing 100 lbs. of finished wrought-iron or steel bars by the combined process of making pig-iron, fining the same, and working it into wrought-iron or steel bars.

Nílgiris, but it is doubtful whether the cost of planting could be so much reduced that charcoal might be delivered at the rate of, say, Rs. 7 a ton at any works that would be established on these hills.

500. Ritter C. von Schwarz, in his report dated 19th April 1882, on the financial prospects of iron-making in the Chanda District of the Central Provinces, published in the *Gazette of India* with the Resolution in the Department of Finance and Commerce, No. 2899, dated the 4th August 1882, states that for the production of one ton of finished iron or steel the following fuel would be required in that locality :—

Charcoal	1·30 tons.
Mineral Coal from Warora	3·00 tons.

The quality of the charcoal which would be produced in the Salem District would probably equal that of the Chanda forests, and there is no ground for assuming that the charcoal of Casuarina or blue-gum would be inferior. Making these assumptions, 10,000 tons of finished iron or steel might be produced by the following quantities of fuel :—

	13,000 tons charcoal for making pig-iron	=	52,000 tons of wood.	
	22,000 do. do. finished iron	=	88,000	„ „
Total ...	35,000 tons of charcoal	=	140,000	„ „

In the Salem District we have assumed that 52,000 tons of wood would require 104,000 acres of efficiently protected forest, while on the Nílgiris 88,000 tons of wood might be produced on, say, 15,000 acres of blue-gum plantations. But even with this arrangement, a very large area of forest and plantations would be required to produce an annual outturn of 10,000 tons of finished iron or steel, the value of which on the spot would probably not exceed Rs. 1,200,000.

It is obvious that this matter will require the most careful study on the spot.

501. I have read with great interest the report already quoted on the prospects of the iron industry in the Chanda District, and I may perhaps be permitted to draw attention to a few points which bear upon the question as it presents itself in Salem.

On the authority of the Conservator of Forests in the Central Provinces, Ritter von Schwarz states that the forests in the vicinity of Lohara cover about 520 square miles, capable of yielding 16,000 tons of dry wood per square mile, part of which will be sold as timber, while 11,000 tons may be counted upon as available for reducing to charcoal. He also states that the annual yield in charcoal will be 61 tons per square mile, and says that the forest is expected to be regenerated in 40 years. If these figures are correctly understood, the annual yield expected by the Conservator per square mile is as follows :—

Wood, total yield	400 tons.
Wood available for charcoal	275 „
Charcoal	61 „

This assumes that one ton of charcoal requires 4·5 tons of wood, and that the average annual yield of wood, including timber, will be 0·625 tons per acre. For a forest protected from fire, in the excellent soil and favorable climate of the Chanda District, this is a moderate estimate, but in the whole Chanda District, excluding Ahiri with which the present question has no concern, there are at present only two blocks protected from fire, and these are, according to Major Doveton's report for 1881-82,—

The Taroba block ...	25,509 acres	protected since 1873.
„ Goverdhun „ ...	13,931 „	„ 1874.

Moreover, the 520 square miles named include a considerable area of second-class reserves, for, according to the report for 1881-82, the total area of first-class

reserves in that part of Chanda to which these remarks relate is only 359 square miles. Portions of the second-class reserves are well stocked and very valuable, but only the first-class reserves have hitherto been really protected, and in these fire has, as explained, been kept out only from a small portion.

The mean annual rainfall of Chanda town is 50 inches, and the forests in question have probably the same amount. I have no doubt that their condition has greatly improved since I visited them in 1878. In so favorable a climate and on the excellent soil of these forests, the annual production would, if they were efficiently protected from fire and otherwise, be much higher than the estimate quoted. But until the whole area from which the supply is proposed to be drawn has actually been protected from fire for a series of years, the establishment of furnaces expected to turn out 25,000 tons of finished iron annually, which is the quantity assumed in the report, with the aid of charcoal, would, in my opinion, not be a safe undertaking. Nor has it anywhere been stated authoritatively, that the manufacture of iron on a large scale with charcoal in the Chanda District will, under existing circumstances, be a safe commercial undertaking. On the contrary, the Government of India, in paragraph 6 of the Resolution quoted, decline to be responsible for the accuracy of any calculations or estimates put forward in this matter.

502. But, if anywhere in India, circumstances are favorable in the Chanda District, where, in addition to extensive forests, the Warora coal is available. The rates of the different classes of fuel at the iron works, proposed to be established 17 miles from the coal mines, are stated by Ritter von Schwarz as follow:—

	Rs.	A.	P.	
Charcoal	7	0	0	per ton.
Large Coal	5	13	0	,,
Slack Coal	2	13	0	,,

According to the report, the Conservator is confident of being able to deliver 32,000 tons of charcoal a year at the works at Rs. 7 per ton, and apparently he hopes to do this without incurring a heavy deficit on this account. I have my doubts whether this can be accomplished, but at all events these are the conditions believed to exist in the Chanda District. In Salem there is no coal, and I feel sure that the charcoal required cannot be delivered at anything like the low rate estimated for the Chanda forests.

503. This is how the matter stands at present, and the data set forth will show that the question of iron-making on a large scale in Salem is mainly a forest question. The first step must be to constitute reserved forests, to place them under efficient protection, and then to see what amount of charcoal suitable for iron-smelting can be produced annually, and at what price it can be made. The Porto Novo Iron Company relied upon charcoal for their manufacture, but they took no steps to produce the needful fuel on a limited area.* The fuel supply at Pulampatti at that time was good, and the works at that place were probably closed for other reasons than the scarcity of fuel which, however, would have been felt, had operations been continued.

If it is intended to pave the way for iron manufacture on a large scale in the Salem District, this must be done gradually. As the forests improve they will yield larger quantities of charcoal every year, and as the quantity of fuel available increases, so also may iron-smelting assume larger proportions.

But such gradual expansion would not pay, and private capital cannot be expected to embark in such an undertaking at present. It could only be done by the establishment of iron works owned and worked by the State.

504. These remarks will have made it clear that in selecting areas to be constituted reserved forests, with the special view of promoting the iron industry, the first aim must be, to place a sufficient area under protection in order to maintain the existing native industry, and that if it is intended to go a step further and to provide charcoal for iron works on a large scale, the question of the conditions under

* Mr. H. E. Stokes informs me that the Pulampatti works were supplied with charcoal from Sholapádi, 18 miles higher up the river, where the charcoal was made in large closed furnaces. The wood was got from the jungles about Sholapádi and up the river, and the charcoal was carried in boats to Pulampatti. At that time the Sholapádi and other jungles near the Cauvery were extensive and capable of yielding an ample supply of fuel, and the carriage of the charcoal down the river was very cheap.

which such works can profitably be established, and the extent of forest that will be required for this purpose, must be studied on the spot in detail by persons practically conversant with the manufacture of iron with charcoal, acting in conjunction with the most competent Forest Officers available, who should be deputed to select these areas.

505. It will obviously not be possible to invite private capitalists to embark in iron manufacture in the Salem District, until a sufficient area has been constituted reserved forest and has during a series of years been continually protected against fire, and until a safe estimate of the annual yield of charcoal per acre in forests thus treated can be made.

The Porto Novo Iron Works, which were established in 1830, used chiefly the ores of the Salem District. To their works at Porto Novo they conveyed them by water down the Coleroon and later by the Khán Sáhib's canal, which was opened out in 1854. But no arrangements seem to have been made to secure a sufficient and permanent supply of fuel, and this was probably the chief reason why the works had to be abandoned. To their works at Pulampatti on the Cauvery river the ore was carted 20 to 25 miles from the Kanjumalai hill: at this place the furnaces were at work as late as 1861, and fuel at that time was abundant. Yet they were not successful commercially.

506. In advocating, as a first step, measures to ensure the maintenance and extension of the native iron industry, I have not lost sight of the fact that iron-making in the small native furnaces is extremely wasteful. As shown by Dr. Warth in a paper on charcoal iron industry in India of 1881, the manufacture of finished iron by the native process requires more than ten times its weight in charcoal.

577. It is for consideration whether an attempt should not be made gradually to improve the native process in the direction of making it less wasteful by introducing blast furnaces of a smaller size, so constructed and arranged that native workmen can keep them going. The idea was started by Dr. Warth in the paper quoted, in which he wrote as follows :—

"A small high furnace should be constructed as a model and worked by native workmen. When once the work has been started and pig-iron has been produced, other somewhat larger furnaces could be made, and the total outturn of iron could be regulated at will by increasing the number but not the size of the furnaces."

This, however, would require that a Metallurgist, practically conversant with charcoal iron-making be attached to the Forest Department of this Presidency, and it is for consideration whether this should not be done.* In that case he would commence his operations in the Salem District. This arrangement would have the great advantage that the work would, as already explained, expand gradually, and that the improvement of the native method could be started at once. But it would involve the employment of Government agency in the matter. If this is not desired, and if it is decided that operations on a larger and improved scale must be initiated by private enterprise, then action must be delayed until a sufficient area of forest has for some time been efficiently protected and has attained a condition in which the required yield per acre, on the smallest possible area, can with certainty be depended upon as a permanency.

Selection of Reserves for other purposes.

508. Mr. Cherry has for some time past been employed in selecting areas to be constituted reserved forests. When I was in camp with him, he had completed the examination of the forests in the eastern and south-eastern parts of the district, and had indicated on the taluk maps (scale 1 inch = 1 mile) the areas recommended by him. Since then he has, I understand, been engaged in the Sub-division. As a preliminary examination of the localities, the work done by him will doubtless be useful, but his time would have been better utilized had he been directed to select areas to provide for certain specific purposes, such as the

* For a long time, while the mines and works connected with them on the Harz mountains in Hanover, which were a State concern, were worked with charcoal, the administration of mines and forests was entrusted to one Department, though eventually they were separated.

supply to the railway, to towns and for iron-smelting. While marching through the district in January last, I urged upon the Conservator the expediency of altering the plan of work and at once directing Mr. Cherry to select additional reserves for the railway.

509. Large areas had been selected by Mr. Cherry on the Jávádis, much of which is bamboo forest, and I had an opportunity of discussing with him on the spot his proposed reserves.

Ponakád cultivation, which formerly destroyed vast areas of forest on these hills, has now been stopped almost entirely, and permanent fields have taken its place. Except near the edge of the plateau, and in the valleys which adjoin the open country the demand for bamboo and most kinds of wood is only local; teak and sandalwood being exceptions. These two should be made reserved trees and should be strictly protected. In the valleys leading into the plains, and on the outer slopes, reserves should be demarcated, but on the plateau the work may be postponed until the more necessary work elsewhere has been accomplished. The soil on the Javádis is excellent, much of the forest is very luxuriant, and as soon as these valuable forests can be utilised for the railway, for iron-smelting or otherwise, the constitution of reserves should be taken in hand. Meanwhile there is more urgent work elsewhere.

There is hardly a district in the Presidency in which the necessity of forming reserved forests is greater than in Salem, but the business must be done methodically, and the safest plan is to take in hand those cases first where the formation of reserved forests is necessitated by definite requirements.

510. In the Sub-division where Mr. Cherry has lately been employed, five sandalwood reserves, aggregating 12,960 acres, had previously been selected in addition to a sandalwood plantation. In February 1881, the District Forest Officer reported that they had been demarcated by stones and cleared lines, but the rights of other persons in them had not been enquired into and settled; and meanwhile these sandalwood reserves are not specially protected; certainly not against cattle and fires.

The sandalwood tree, though it is widely spread over the plateau of Mysore and the hills of Southern India, is always found scattered. Considering the great value of the wood, and its importance as an article of trade, efforts should now be made in a methodical manner to place sufficient areas of sandalwood-producing forest under efficient protection, and within these areas to increase the proportion of sandalwood by sowing and planting. The idea seems to have been entertained that such reserves should only contain tracts which produce sandalwood. This idea, however, could not be carried out, for areas without the tree will always be found to alternate with tracts in which sandal is found. The boundaries of the sandalwood reserves on the Denkanikóta hills require revision, and I understand that this has been done by Mr. Cherry. The revenue from sandalwood alone in the Salem District has been as follows :—

—	Total.	Annual Average.
	Rs.	Rs.
14 year—1862-63 to 1875-76	1,47,537	10,538
5 year—1876-77 to 1880-81	47,599	9,520

Clearly it is well worth while to make efforts to increase the supply of this wood and to concentrate its production on smaller areas. In certain localities it will be necessary to be satisfied with protecting sandalwood as a reserved tree, in others sandalwood reserves must be formed. Considering the limited demand at present for other wood and bamboos in the taluks which form the Sub-division, it seems to me doubtful whether the constitution of reserves here may be classed among the urgent forest requirements of the district. This remark does not, however, apply to the tracts which adjoin the open country of Mysore, nor to those which are near the Bangalore branch of the Madras Railway.

511. It is not possible now to frame even an approximate estimate of the area which should be demarcated as reserved forest in the Salem District. But

so much is clear, that the formation of reserved forests need not interfere with the extension of cultivation in this district. As regards the hills, the main point to bear in mind is, to maintain and improve the forests on the slopes and in the valleys. Several of the hill ranges in this district have on the top a considerable extent of flat or undulating ground, with fertile soil and a plentiful water-supply. These plateaus are often broken up by valleys, and such broken ground it will be well to keep under forest; but there seems no reason for restricting cultivation on the top. On the fertile plateau of the Javádis for instance, every effort should be made to extend cultivation, provided the valleys and slopes are clothed with well-stocked forest. On the Shevaroys nearly 10,000 acres have been taken up by planters, one-half of which has been planted up with coffee. Regret has been expressed that the fine old evergreen sholas on these hills have been cleared, in order to make way for coffee. On extensive plateaus, such as the Nílgiris, it certainly will be beneficial to have broad belts of forest on the higher ridges, and on the Shevaroys also it might perhaps have been well if belts of forest had been maintained for shelter. But as a rule it may, I think, be accepted that on these minor hill ranges the slopes, valleys and broken ground should be under forest, while the plateau should be given up for cultivation, those cases excepted in which it may be decided to form sandalwood reserves on the plateau. The shifting and destructive system of *ponakad* clearings practised by the Malaialis and other inhabitants of these hills has justly been prohibited by the Collector in the Salem District.

In the low country the reserves proposed to be formed will chiefly be for the supply of fuel to the railway and large towns, and of charcoal for iron smelting. In addition to these it may perhaps be found necessary, in the more open portions of the district, to establish forest reserves for the supply of fuel to villages; but as far as my information goes at present, there seems no necessity for declaring large areas as reserved lands, and thus impeding the extension of cultivation.

CHAPTER X.

SOUTH ARCOT.

512. I entered the South Arcot District, coming from Attúr, in Salem, on the 26th January and marched through the Kallakurchi and Villapuram taluks to Gingee, which place I reached on the 31st. After examining the Gingee reserves on the 1st and 2nd February, I proceeded to Tindivanam, whence I visited the Kamalampat and other reserves between that place and the coast, and left for Tinnevelly on the 6th February. The Conservator accompanied me from Salem to Gingee; Mr. E. Buck, Secretary to the Government of India in the Revenue Department, joined me at Villupuram; Major Campbell-Walker went with Mr. Buck from Gingee to Tindivanam, and then preceded me to Tinnevelly. From Singarapettai, in the Salem District, I had, on the 17th January, visited the Chinnasamudram reserve on the eastern slopes of the Javádis near Chengam in the Tiruvannámalai (Trinomalai) taluk. Mr. Wooldridge, the District Forest Officer, accompanied me throughout the South Arcot District.

Forest Area.

513. The total area of the district is 3,118,720 acres; the population numbers 1,814,738 (1881) or 372 to the square mile.

The area of the district may be sub-divided as follows :—

	ACRES.
Zemindari and Inam land	176,129
Government land occupied	1,207,863
Do. unoccupied	1,734,728
Total Area of the District ...	3,118,720

These figures do not, I believe, include the lands of the Kalráyan Poligars much of which is forest, which are estimated at 193 square miles or 123,520 acres. The unoccupied land (waste and forest) is 1,735,000 acres, or more than one-half of the Government land in the district. It must however be borne in mind that, as a matter of fact, some of the land entered in the village accounts as waste is under temporary cultivation, either in excess of the area stated in the patta (*Siwai jasti*), or without any patta at all (*Siwai jama*).

514. The waste and forest may be classified as follows, but it must be understood that the figures are only estimated :—

	ACRES.
Grass, Waste and Sand	1,198,000*
Scrub	204,000
Forest	333,000
Total ...	1,735,000

The area of scrub and forest is thus 537,000 acres, or 17·21 per cent. of the total area of the district.

The following are the principal stretches of grass, waste and sand :—

(1) A large tract of high land north-east of Tiruvannámalai (Trinomalai).

(2) Belts of rock, gravel, and sand between the scrub jungle of Tindivanam and the coast, interspersed by a few well-wooded tracts, such as Kamalampet.

(3) Red hills of the Cuddalore taluk, and bare tracts with sand in Chidambaram north of the Vellár river.

(4) A large stretch of high ground with a few *Acacia leucophlœa* trees between the Manimukta and Vellár rivers in the Kallakurchi and Vriddháchalam taluks.

515. With reference to its situation, the scrub and forest in the South Arcot District may be divided into three great groups—

(*a*) The forests on the higher hills, viz., on the eastern slopes of the Thenmalais, Javádis, and Peria Kalráyans.

(*b*) The forests on the high ground and lower hills between these hill ranges and the coast.

(*c*) The forests on the sea coast.

Climate and Vegetation.

516. The mean monthly rainfall of the South Arcot District appears from the following figures :—

	Tindivanam.	Cuddalore.	Vriddháchalam.
January	0·39	0·77	0·41
February	0·77	0·33	0·42
March	0·33	0·39	0·17
April	0·60	1·18	0·54
May	2·78	1·60	2·00
June	2·00	1·29	1·36
July	3·01	2·20	2·75
August	6·81	4·35	4·42
September	6·61	4·80	5·17
October	8·36	7·80	5·58
November	7·85	12·83	6·24
December	2·74	4·69	2·71
Total ..	42·25	42·23	31·77

A long dry season from January to May, a scanty south-west monsoon from June to September, and a rainy season during the north-east monsoon from October to December.

* Includes 5,927 acres of sand-waste taken up for plantations of Casuarina and other trees by Government.

With regard to the character of the vegetation, there is the broad distinction between deciduous and evergreen scrub and forest. On the higher hills, the deciduous forests cover all dry and exposed slopes, while evergreen forest is found at high elevations and in moist sheltered ravines. On the Thenmalais and Javádis, the condition of the forest is much better than on the Kalráyans, where (in lands belonging to and claimed by the Poligars) *ponakad* cultivation continues. The slopes of the Kalráyans are in dispute between Government and the Poligars.

517. The belt of deciduous forest extends a considerable distance eastward from the foot of the mountains. Thus on the Tiruvannámalai (Trinomalai) hills the forest principally consists of namai (*Anogeissus latifolia*), maruthai (*Terminalia tomentosa*), vengai (*Pterocarpus Marsupium*), koongliam (*Boswellia*), with an admixture of blackwood; while on level ground, porasu (satinwood), turinji (*Albizzia amara*), and karungali (*Acacia Catechu*) are the principal trees. Extensive tracts of *Acacia Catechu* and *Acacia leucophlœa* are found on black soil in the Vriddháchalam taluk between the Manimukta and Vellár rivers. In a few places, deciduous forests extend further east. Thus there are, twenty to twenty-five miles from the coast, extensive tracts of turinji and satinwood on high ground and red soil in the Cuddalore taluk between the Gadilam and Manimukta rivers.

518. Along the coast, and within twenty miles from it, the forest is chiefly evergreen; kachan (*Memecylon*), irumbili (*Maba buxifolia*), vakkanai (*Diospyros Chloroxylon*), with kora (*Ixora parviflora*) being the most common species.

These are associated, in the north, with palla (*Mimusops indica*), and, in the south, with vennangoo (*Pterospermum suberifolium*). With these evergreen trees—and often forming patches of dry forest on the outskirts—are associated a number of deciduous species, of which karungali (*Acacia Catechu*), porasu (satinwood), turinji (*Albizzia amara*), woddan (*Lebidieropsis orbicularis*), and velungai (*Dalbergia paniculata*) are the most common.

Large stretches of alluvial soil on the coast between the Vellár and Coleroon rivers are stocked with mangrove forests.

519. Midway between the hills and the coast is an extensive belt of high ground, with rocky hills of gneiss boulders, stretching from north to south, stocked with mixed forest in which the evergreen species generally preponderate. These tracts are full of thorny shrubs, of which yelanthai (*Zizyphus*), kala (*Carissa*), merikalan (*Randia*), karai (*Canthium parviflorum*), anaimullu (*Acacia Latronum*) and *Capparis* are the most prominent.

In this class of forest, the chief evergreen trees are vakkanai (*Diospyros Chloroxylon*), naluvai (*Canthium umbellatum*), kiluvai (*Protium caudatum*), terani (*Webera asiatica*), yetti (*Strychnos Nux-vomica*) and thethan (*Strychnos potatorum*). The principal deciduous trees are turinji (*Albizzia amara*), parambai (*Acacia ferruginea*), thanakken (*Givotia rottleriformis*), vel-vélam (*Acacia leucophlœa*), velungai (*Dalbergia paniculata*), wodiyan (*Odina Wodier*), woddan (*Lebidieropsis orbicularis*) and uduppai (*Grewia*). The Gingee reserves may be taken as an instance of this class of forest.

Control of Forests.

520. Formerly, the forests were open to all without restriction, for pasture, cutting, and burning. About 1834, certain conditions were imposed upon the cutting of fuel and the making of charcoal for iron manufacture, which was then carried on at Porto Novo on a large scale. In 1860, the cutting of firewood and timber for sale was made subject to the payment of fixed rates per cart-load according to the description of the produce removed. In 1861-62, the Jungle Conservancy rules were introduced, and in 1867 the first attempt at separating the areas intended to be permanently maintained as forest was made by Captain Campbell Walker, then in charge of the forests in the Salem and South Arcot Districts. The chief object at that time was to provide a permanent supply of fuel for the Railways. For this purpose, five blocks in the Gingee hills, three on the slopes of the Javádis, and one on those of the Kalráyans were selected. At the same time, plantations of Casuarina in the old bed of the Ponnár river, commonly known as the Malatár, on the coast near Cuddalore, Merkanam and Porto Novo were commenced, at Captain Campbell Walker's suggestion, from Jungle Conservancy Funds under the orders of the Collector.

521. In 1870, a separate Forest Officer was appointed to the District, and in 1874 the existing plantations were made over to him, and the selection of reserves for the provision of fuel to villages on account of Jungle Conservancy was begun on a large scale. At that time, the Collector was Conservator of Forests in his District, and the Divisional Forest Officer was placed in charge of all forest business, including the Jungle Conservancy.

522. The present state of things is as follows :—

All forests in Tiruvannámalai (Trinomalai) and Kallakurchi taluks are under the Forest Department. In Kallakurchi, which had become much denuded by the large consumption of firewood for sugar-boiling without payment, a number of tracts of waste land have since 1874 been demarcated as village fuel reserves on account of Jungle Conservancy. In Tiruvannámalai (Trinomalai) also two tracts near the chief places, Tiruvannámalai and Pennatur, have been demarcated as fuel reserves under Jungle Conservancy. In the other six taluks, with the exception of the Gingee and two other reserves, and the Merkanam, Malatár and Velúr plantations, all forest operations are under Jungle Conservancy.

The reserves and plantations are of two classes (*Imperial* and *Jungle Conservancy*); of so-called Imperial reserves thirteen blocks, aggregating 95,757 acres, have received the sanction of Government or the Board of Revenue, and most of them are demarcated and protected. The following is an abstract of these tracts :—

Name of Reserve or Block.	Area in Square Miles.		By what Authority selected.	Number and Date of Government Order sanctioning Constitution.	Remarks.
	Ascertained by Survey.	Estimated.			
Mutukadu	4·82	..	Selected by the Deputy Conservator of Forests in consultation with the Collector of the District in 1869.		These reserves are known by the name of the Gingee reserves; they have been surveyed and fenced.
Siruvadi	2·61	..	Do. do. in 1872.	Board's Proceedings, dated 31st August 1869, No. 6512.	
Kottamangalam ..	2·60	..	Do. do. in 1869.		
Paddipallam ..	5·83	..	Do. do. in 1869.		
Periamur	14·10	..	Do. do. in 1869.		
Gungaveram ..	15·38	..	Do. do. in 1872.		This reserve has been surveyed and fenced.
Mudenai	..	6·25	Do. do. in 1868.		
Chinnasamudram ..	..	10·00	Do. do. in 1868.		
Perungolathur ..	..	7·50	Do. do. in 1868.		
Tandrampet ..	..	17·96	Proposed by the Conservator of Forests in 1877 and formed into a reserve by the Deputy Conservator with the aid of Revenue Officers.	G.O., dated 26th August 1880, No. 1023.	
Nattamur	14·84	..	Do. do.		
Tiruvannámalai Cusba.	11·73	..	Selected by the Deputy Conservator of Forests in consultation with the Revenue Department in 1872.	G.O., dated 4th April 1874, No. 4.	Surveyed and mapped by the Department.
Thenmálai Forest ..	..	36·00	Selected by the Deputy Conservator of Forests with the aid of the Revenue Department in 1868.	G.O., dated 19th October 1874, No. 1346.	On the Thenmalais, a branch of the Javádis. Limits not yet definitely settled. There are nine hill villages within this reserve under the jurisdiction of the Tirupatúr Tahsildar, Salem District.
Total ..	71·91	77·71			
Grand Total ..	149·62				

There are also 175 reserved blocks under Jungle Conservancy called village firewood reserves and village firewood tracts, the area of which is estimated at 149,210 acres.

There are seven Imperial plantations aggregating 3,754 acres, and seven Jungle Conservancy plantations aggregating 2,173 acres. The aggregate estimated area of reserves and plantations is thus 250,894 acres.

The area of the open forests not included in any of the reserves is estimated at 236,800 acres which are classed as Imperial, and 55,040 acres which are classed under Jungle Conservancy.

The former are all situated in the Tiruvannámalai and Kallakurchi taluks, while the open forests in all other taluks are classed under Jungle Conservancy.

This does not include the area under dispute on the eastern slopes of the Kalráyans, which is reckoned at 18,000 acres.

523. Control is exercised to the following extent over the working of the open forests and the reserves:—

Pasture without special permission is prohibited in the Imperial reserves; but, as a matter of fact, this prohibition has never been enforced, except in so far that goats are excluded. In reserves under Jungle Conservancy also goats have, as far as possible, been excluded. As regards cattle, there is no restriction, except that places where sowings have been made are supposed to be temporarily closed. The open forests are open to pasture without restriction, and no payment whatever is made for grazing in them. In reserves no payment has hitherto been made for cattle permitted to graze, but by a late order of 27th June last, the Board of Revenue sanctioned the proposal made by the District Forest Officer and the Collector to levy a fee upon cattle coming to graze in the reserves from other districts.

524. Fresh cultivation is supposed to be prohibited in all reserves, but it is impossible to say whether the prohibition is really enforced or not. In several instances I found that plots of land had lately been broken up in the midst of Jungle Conservancy reserves. I was assured that such land was not held under patta, but had been ploughed up in accordance with the existing custom under which waste land may be broken up for cultivation without previous application. In the Gingee Imperial reserve, a patta was granted in 1874 by the Divisional Civil Officer for a piece of land within the boundary of the reserve. The holder paid the assessment regularly, but kept quiet, so that the Forest Officer only learnt of the existence of the patta in 1875 when the holder commenced felling. The forest was cut, the wood was sold by the holder, and the land was brought under the plough, it being held that the patta having once been given, it could not be cancelled. These fields now form an enclosure of private land within the reserve.*

The cutting of green wood in all reserves without permission is prohibited, and in some cases, such as in the Gingee reserves, it has been possible to enforce this rule. In Jungle Conservancy reserves, thorns for fencing and leaves for manure may be collected, and dry wood may be removed in head-loads without charge or permit.

In open forest, the rule is that reference shall be made to the Forest Officer before land stocked with forest is given up for cultivation. In these forests, certain kinds of trees are reserved, which are only cut by the Forest Department; others may be cut on licenses and free passes. Thorns for fencing, leaves for manure and dry firewood, in head-loads, may be removed without charge, and no permit is required to be taken out.

525. In addition to such protection as the existing rules permit, much has been done to improve the condition of the areas in charge of the Forest Officers by planting and sowing. The result of these operations may be summarized as follows:—

* The following is the substance of a statement which Mr. Wooldridge, the District Forest Officer, has been good enough to give me of this case:—

"The demarcation of land for the Gingee Forest reserves began in 1869 under Board's Proceedings, No. 6512, dated the 31st August 1869, and was completed in 1872."

"The taluk accounts of 1870 for Krishnapuram Village show that out of nine cawnies which were entered as 'reserved' and formed part of the demarcated reserve, and were covered by jungle and tamarind trees, five cawnies were held on patta by one Ramaswami Gavunden, who, however, resigned in 1872. At the end of 1873—*i.e.*, after the completion of the demarcation—one Sadasiva Iyer applied for these five cawnies, and in 1874, without consulting the Forest Officer, the Divisional Officer, on a misleading report of the Village Officers, granted the land on patta. In 1875, when the pattadar began to fell the jungle on his land, the Forest Officer discovered the alienation and represented the matter to the Divisional Officer and the Collector, who, however, held that the patta not having been fraudulently obtained could not be cancelled, and that the pattadar could not be interfered with."

"Again, in 1877, the same pattadar felled a large piece (five cawnies) of the reserve adjoining his patta land, and, on objection made by the Forest Officer, produced a patta for it. On complaint by the Forest Officer to the then Divisional Officer, it was found in 1879, after enquiry, that this patta had been fraudulently obtained, and it was cancelled. The fraud was traced to the taluk Dufterbund—a relation of the pattadar—and the Village Kurnam, and they were punished. The Divisional Officer who held this enquiry in 1879 also expressed his opinion that had the locality been inspected by the Divisional Officer who disposed of the question of the original patta in 1875, that officer would not have decided as he did; but seeing that the matter had been decided by the Collector, he stated that he did not feel competent to alter its disposal, however much it was to be regretted."

Plantations of Casuarina and Cashew-nut.

764 acres actually stocked near the coast.
49 do. in the Malatár (old) bed of the Ponnár river.

Total 813

Seed has been sown during the past five years on a large scale in all reserves where it seemed desirable to stock blanks. The following are the areas operated upon :—

—	In Imperial Reserves.	In Jungle Conservancy Reserves.	Total Area Sown.
	ACRES.	ACRES.	ACRES.
Tindivanam	98	715	813
Tiruvannámalai	..	..	..
Villupuram	5	1,444	1,449
Cuddalore	..	864	864
Tirukoilúr	..	259	259
Kallakurchi	..	558	558
Vriddhachalam	..	1,786	1,786
Chidambaram	..	670	670
Total ..	103	6,296	6,399

Most of this sowing has been broadcast, but in many cases the ground was ploughed or the seed dibbled in. As an instance of fair success, I may mention the Velúr Imperial plantation in the Tirukoilúr taluk, where a piece of ground previously almost bare has been partially stocked with vel-vélam (*Acacia leucophlœa*) and other trees, chiefly by ploughing and sowing.

But I have seen several Jungle Conservancy reserves where sowings had been made and money expended without any commensurate results. The system hitherto has been to place those areas only under protection on which money had actually been expended in planting and sowing. The result has been that after the young plants have come up, the cattle visit their old grazing grounds as heretofore and feed on the tender shoots of the seedlings raised by the Forest Officers. This may be one way of benefiting the ryots through the Jungle Conservancy operations, but it certainly is not a rational application of public funds. The first step which should precede all other measures must be strict protection continued during a series of years; and only after the practice of such protection has become firmly established, should money be expended in sowing and planting.

526. From these remarks it will be understood that much has been done for Forest Conservancy in this district. Out of an area of 1,735,000 acres of forest and waste land at the disposal of Government, 251,000 acres, or about 7·8 per cent. of the entire district, has been demarcated and set apart to be permanently maintained as forest. On my present tour, I visited the following reserves and plantations :—

Imperial.

Chinnasamudram.
Gingee (3 Blocks).
Velúr Plantation.
Malatár Plantations.

Jungle Conservancy.

Kallakurchi taluk (3 Reserves).
Tirukoilúr „ (4 „).
Villupuram „ (13 „).
Tindivanam „ (3 „).

The condition of the reserves visited is exceedingly varied. In some cases, the protection has been nominal, while in others the forest had evidently greatly benefited by protection. The great advantage which most of these reserves possess is their immunity from fire. In the deciduous forests along the hills, fires are of annual occurrence, but in the evergreen tracts fires are rare.

In some of the deciduous forests of Tiruvannámalai, regular fire protection, with a system of fire lines, has been established by Mr. Wooldridge with considerable success.

Financial Results.

527. The financial results of forest administration in this district appear from the following statements of receipts and charges during the six years ending with 1881-82 :—

Imperial Forests.

Years.	Receipts.	Charges.			Surplus.	Deficit.
		A, Conservancy and Works.	B, Establishments and Contingencies.	Total.		
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1876-77	11,291	15,460	8,491	23,951	..	12,660
1877-78	5,305	10,779	8,936	19,715	..	14,410
1878-79	7,536	6,174	9,274	15,448	..	7,912
1879-80	10,214	10,661	10,098	20,759	..	10,545
1880-81	12,182	8,069	9,826	17,895	..	5,713
1881-82	13,052	7,108	10,258	17,366	..	4,314
Total ..	59,580	58,251	56,883	1,15,134	..	55,554

Jungle Conservancy.

Years.	Receipts.	Charges			Surplus.	Deficit.
		On Works.	On Establishment.	Total.		
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1876-77	10,777	10,200	1,493	11,693	..	916
1877-78	6,628	7,367	1,084	8,451	..	1,823
1878-79	10,397	7,934	1,750	9,684	713	..
1879-80	9,853	7,269	1,758	9,027	826	..
1880-81	8,535	6,468	2,633	9,101	..	566
1881-82	11,158	10,731	90	10,821	337	..
Total ..	57,348	49,969	8,808	58,777	1,876	3,305

And the averages during these six years have been as follows :—

—	Imperial.	Jungle Conservancy.
	Rs.	Rs.
Charges	19,189	9,796
Receipts	9,930	9,558
Deficit annually ..	9,259	238

528. The annual average amounts realized during the five years ending 1880-81 on account of the chief items of Imperial revenue have been as follows :—

		Rs.
Sale of Material collected at Depôts by Government Agency.	Timber	2,195
	Sandalwood	1,940
Seigniorage on Firewood		1,663
Do. on Bamboos		867
	Total ...	6,665

Seigniorage on building wood also forms an important item.

The Jungle Conservancy revenue during the same period may be classified as follows :—

	Rs.
Amani Jungles (Reserves)	583
Jungles worked on licenses	6,514
Plantations	1,436
Topes	689
Miscellaneous	16
Total ...	9,238

Suggestions regarding future Management.

529. I now proceed to submit suggestions regarding the future management of the Government forests in this district. Eventually all or most of the sanctioned reserves must be constituted reserved forests under the Forest Act. But this may require some time in the case of many of the present tracts. Meanwhile it obviously is of the greatest importance that the existing forest reserves and plantations, whether Imperial or Forest Conservancy, should be formally recognized, and that efficient steps should be taken to guard against encroachment and alienation. The Revenue Survey of the South Arcot District is now in progress, and I submit that all reserves and plantations should be entered on the maps and in the village registers. It should further be distinctly understood that land may not, without the sanction of Government, be given on patta, or otherwise broken up for cultivation, within these areas.

530. I am also of opinion that, in order to guard against encroachment, the boundaries of the reserves must be marked on the ground in a more efficient and conspicuous manner than has been done hitherto, so that they can be readily recognized by everybody. In many instances, the only boundary marks existing are a few stones put together, or shallow and short ditches at long intervals. I submit that each forest reserve must be demarcated in a permanent and conspicuous manner, so that no person may be in doubt whether he is inside or outside a reserved forest.

Areas to be selected for Special Protection and Improvement.

531. The protection which is at present enforced in most of the Jungle Conservancy reserves is exceedingly slight, and, as a matter of fact, only amounts to this that goats have more or less been excluded, and that cutting of wood on a large scale has been prohibited. In many instances even this slight degree of protection enforced has had a beneficial effect, and I was particularly gratified in noticing the satisfactory condition of the Kamalampat reserve in the Tindivanam taluk, 1,200 acres, on high ground, in the midst of open forestless country, consisting chiefly of evergreen scrub, with *Acacia Catechu* and satinwood on the outskirts. It is now a continuous mass of dense scrub, 6 feet high, and from it stand out, in a prominent manner, the shoots of *Mimusops indica*, giving promise of high forest hereafter which will be of great value in this part of the country. *Acacia Catechu* and satinwood also had made good progress, and protection against cutting had evidently been efficient.

In his report for 1880-81, Mr. Wooldridge mentions a reserve in Vriddhá-chalam taluk, which has lately yielded a large quantity of brushwood, cut in order to strengthen the bund of a tank which was in danger of being breached. This reserve was taken up in 1875 when the forest growth was quite thin. When cut, it is reported to have given an outturn of 17 tons per acre, which seems almost incredible. Whether this figure is correct or not, there is no doubt that many of these areas have considerably improved since they were demarcated. I have however seen other areas which show no signs of improvement, although they had been reserved and nominally protected for a period of from six to eight years.

532. Under these circumstances, I am disposed to advocate that, without giving up any of the reserves selected, a limited number of the present reserves be chosen for strict conservancy and improvement. These areas should be selected wherever there is likely to be considerable demand for the produce, that is, in the midst of the open country, and in the immediate vicinity of towns or large villages, of iron furnaces, sugar factories, or other wood-consuming establishments. As a matter of course areas with good soil only should be selected for special treatment so as to ensure success. Planting and sowing should be strictly limited to these

special areas. Hitherto sowings have often been carried on on a large scale in areas which were perfectly blank, where the seedlings had no shelter and were not sufficiently protected against cattle.

533. The present practice is, in areas where sowings are made, to prohibit grazing during the first year or two. But the areas at present operated upon are much too scattered for such prohibition to be enforced. Whenever areas are taken up for special protection and improvement as here suggested cattle must be excluded. If this is not done, all money expended upon such areas is thrown away. In the vicinity of Villupuram I examined, with great interest, a number of babul reserves, chiefly above the water-spread of tanks, and was much pleased with the ready reproduction of babul in such localities. As a matter of course the young seedlings were most plentiful where grazing had been less, and if such localities could be selected and closed against cattle, the ground would get stocked with a dense growth of young babul; and, as soon as this end has been obtained, the old trees should all be cut out and sold.

534. What I desire to urge is that the work of protection and improvement should be concentrated, so as to secure, as speedily as possible, the formation of high forest in those localities where forest is most required. The object of forest administration is not to lock up land or to prevent the extension of cultivation, but to produce the largest quantity of wood, grass, and other forest produce on the smallest possible area; and this principle should always be kept in view. It may be objected that the chief aim of forest conservancy in a district like this ought rather to be to keep large areas under wood in order to regulate the water-supply, although it may not be possible to create well-stocked forest upon such areas. To this I reply that forest imperfectly stocked exercises no appreciable influence in regulating the surface and under-ground drainage. It is only compact and closely stocked forest which can be expected to exercise a beneficial effect in this respect.

535. The present suggestion of making a commencement with strictly protecting and gradually improving limited areas is intended to indicate the first step that should be taken. After these forests have grown up, they can be opened to pasture. They will yield, without their condition being impaired, sufficient wood for all requirements; the sale of their produce will furnish the means for extending the work, and it will then be time to take other areas in hand, and gradually to convert as large a portion of the wood-lands and waste in each taluk into well-stocked forest as further experience may show to be necessary.

Pending selection of Reserves the Forest growth on Government Waste must be protected.

536. The following statement compiled from data kindly furnished me by the Collector shows the occupied (cultivated and waste) area in 1874-75 and 1880-81. These years may be regarded as representing the normal state before and after the famine. It will be noticed that a considerable area of waste is occupied. These are partly fields which are allowed to lie fallow, partly lands used for grazing.

Cultivation and Occupied Waste in Government Villages.

Taluks.	Area of Taluks.	Area of Government Villages.	Fasli 1284 (1874-75):			Fasli 1290 (1880-81).		
			Cultivated Area.	Occupied Waste.	Percentage of Occupied Land on Area of Government Villages.	Cultivated Area.	Occupied Waste.	Percentage of Occupied Land on Area of Government Villages.
	ACRES.	ACRES.	ACRES.	ACRES.		ACRES.	ACRES.	
Tindivanam	539,986	519,265	179,668	31,552	40	190,261	32,913	43
Tiruvannámalai ..	588,514	560,606	111,637	12,648	22	105,664	15,761	22
Villupuram	328,738	311,182	149,424	13,263	52	157,101	12,721	54
Cuddalore	293,530	261,788	120,159	9,561	49	126,152	9,148	52
Tirukoilúr	363,966	333,186	129,215	11,335	42	124,126	13,327	41
Kallakurchi	398,464	380,473	99,560	5,856	27	102,276	8,994	29
Vriddháchalam.. ..	381,698	362,312	112,708	9,124	34	132,975	12,186	40
Chidambaram	254,425	236,700	157,604	15,574	73	158,141	15,684	73
	3,149,321	2,965,512	1,059,975	108,913	39	1,096,696	120,734	41

537. It will be noticed that, in all taluks except Chidambaram, which is irrigated both from the Coleroon and the Vellár rivers, as well as in Villupuram and Cuddalore, the unoccupied waste in Government villages is more than half of the area, and that in Tiruvannámalai (Trinomalai) and Kallakurchi it is more than two-thirds. It would therefore seem probable that in all taluks, except perhaps Chidambaram, cultivation in Government villages is capable of considerable extension. And, as a matter of fact, the occupied area in Tindivanam has increased during the seven years in question, in spite of the famine of 1876—78, from 40 to 43 per cent., and in Vriddháchalam from 34 to 40 per cent. The practical conclusion to which these figures seem to point is that, in considering any measures for better utilizing the waste land of the South Arcot District, the gradual extension of cultivation should be borne in mind as an important object to be aimed at, equally with the formation of forests and firewood preserves. One of the chief features which strikes the traveller in most parts of this district is the vast extent of waste land, much of which might be brought under the plough.

538. This remark should not be misunderstood. The climate of the South Arcot District is hot, and, in spite of the vicinity of the sea, dry during a great part of the year. In such a climate what is wanted, in order to promote the prosperity of the agricultural population, is to establish tracts of well-stocked scrub or forest in the heart of the cultivated country, not only to furnish a more abundant supply of firewood, and, in seasons of drought, of cattle fodder, but also to afford shelter against scorching winds and gradually to increase the dew and the moisture in the vicinity of such scrub or forest. So much is clear that in devising measures for better utilizing the 1,735,000 acres of waste at the disposal of Government in this district, the question must not be dealt with from a one-sided point of view. It would, in my opinion, be a great mistake to reserve from cultivation the whole of the waste at the disposal of Government. On the contrary, the ultimate object of forest administration in this district must be to make it possible eventually to bring a much larger area under the plough and to increase the productiveness of the area cultivated.

In spite of the famine, the population of the district has risen from 1,755,817 souls in 1871 to 1,814,738 in 1881. Had there been no famine, it is probable that the population in 1881 would have amounted to over 1,930,000 souls. Corresponding to the increase of population that has actually taken place, there has, as shown above, been a progressive increase in the area of cultivated land. In this district at least there is no ground for apprehending that the annual normal increase of population, which we may hope will not soon again be arrested by famine or other calamities, will not be met by a corresponding increase in the area of cultivated land. The measures advocated in this report, if carried out with judgment and on an adequate scale, will effect a sharp separation between well-stocked forests, grazing grounds and fields, and the result of this will be that it will suffice to keep a smaller area under forest than would be necessary if the woodlands had been left in their present comparatively unproductive condition. Hence the result of these measures will be that more land will be available to be taken up for cultivation, while at the same time the productiveness of the fields situated in the vicinity of the forests will improve. In this manner forest conservancy, if administered with judgment, will aid in providing for the progressive increase of population.

539. On the other hand it will be understood that the measures for better utilizing the waste and forest lands of this district must be comprehensive and must relate to the whole waste at the disposal of Government, and that they must not be restricted to unassessed waste, or to those portions which at present are stocked with scrub or forest. I submit that whenever blocks of waste at the disposal of Government, and situated in the midst of the bare open country, are suitable for the growth of forest, it will be best to set such blocks apart for the formation of forest reserves, whether the waste is assessed or unassessed. Hence it is obvious that whatever natural forest growth may exist on the assessed waste should be placed under protection in the same manner as the forest growth which is found in unassessed waste.

It might be objected that the first step should be the formation of the blocks of waste (assessed or unassessed) to be set apart for forest growth, and that all forest control over the waste outside these blocks should at once be abandoned. The difficulty of this course would be that the selection of these blocks must necessarily require time, that it cannot be accomplished at once, and that until such selection has been accomplished the forest growth on the Government waste must not be left unprotected. Two things must be done; firstly, alienation of such waste as may hereafter render the formation of reserved forests difficult must be guarded against; and, secondly, the natural growth of shrubs and trees on all such waste must, as far as practicable, be protected without interfering with the requirements of the agricultural population in the vicinity of such waste more than can be helped. In order to guard against the alienation of waste which may hereafter be required for the formation of reserved forests, it was intended when the Forest Bill was framed to establish a class of reserved lands protected against alienation by law. These proposed provisions have not been inserted in the Act, and an endeavour must now be made to attain the object by executive orders and by rules made under Section 26 of the Act.

540. Any attempt to determine at the present time what percentage of forest should be maintained as such in each taluk cannot lead to practically useful results; this must be settled by the light of further experience. In some localities it may eventually be found possible to give up part of the lands at present reserved for the extension of cultivation, and in others again it will doubtless be found necessary considerably to increase the reserved area. Taking the whole district, the figures of the following statement show that the occupied land is 41 per cent. of the total Government land, the unoccupied forest and waste being 51 per cent., while the nominally reserved forests constitute 8 per cent. of such area. Clearly therefore ample room will remain for the extension of cultivation, although it may be necessary to place a much larger area under efficient conservancy than the existing reserves.

	ACRES.
Reserves	251,000
Unoccupied forests and waste	1,483,728
Occupied land	1,207,863
Total Government Land ...	2,942,591

Benefits of Forest Conservancy recognized by the People.

541. One important advantage of an indirect nature which has resulted from the Government forest operations in this district has been that the benefits of Forest Conservancy are now being recognized by the people. Mr. Wooldridge informs me that when he came into South Arcot in 1870, the more thickly populated part of it, in the eastern taluks, was much more bare than it is at present. Since 1872 he has observed that the people have set apart little plots in their holdings which they have sown with babul, and that they have planted rows of the portia tree (*Thespesia populnea*) in their hedges. Another feature in the Coast taluks are the plantations of the cashew-nut (*Anacardium occidentale*) on the Red Hills, a practice which I am informed is of old date in the adjoining French Settlement of Pondicherry. Lately, since the establishment of reserves has been commenced, villagers have petitioned that tracts with young growth of vel-vélam, babul, and other jungle near their villages may be taken in hand and protected by Government.

542. In regard to one matter the people will eventually learn to appreciate the benefits conferred upon them by the establishment of the forest reserves; they will obtain a more plentiful supply of charcoal for iron smelting. Iron ores are abundant in the Tiruvannámalai taluk. Here the East Indian Iron Company had furnaces at work between 1858 and 1867, but the work was stopped as the forests had become exhausted. There are also numerous beds of magnetic iron on the Kalráyans and at the foot of these hills, chiefly in the Kallakurchi taluk. A detailed account of these beds is given on pages 69 to 72 of Messrs. King and Foote's

paper on the Geology of South Arcot, published in Volume IV, Part II of the Memoirs of the Geological Survey, 1864.

In the Trinomalai taluk iron-smelting furnaces are at work in 15 villages; in some places work has been stopped, chiefly by the growing scarcity of fuel. Probably in this district also, as in others, the native iron is preferred by the people for their own work to the cheaper English iron, and it may confidently be expected that the improvement of the forests will eventually lead to the revival and the expansion of the old native iron industry.

Forest Revenue must be increased.

543. The next point to which I desire to draw attention is the necessity for increasing the forest revenue of the district. It is an extremely remarkable fact, and one which at first sight it is difficult to understand, that in a district where the total area of forest and scrub is not large, where, except on the Kalráyan hills in the south-western corner of the district, the area of private forest is not extensive, where the people are in the habit of manuring their fields, of using wood as fuel, where, finally, the manufacture of sugar and indigo, both of which consume much fuel, is carried on to a large extent, forest administration should hitherto have resulted in a large deficit. The reason probably is, that hitherto much of the produce of the Government forests has been used without being paid for.

Obviously if this state of things were to continue, all hope of providing the means for better protection and improvement of the forests must be abandoned. Forest administration if undertaken by the State must be self-supporting and must have ample means at its command to attain the objects aimed at. These means must be obtained by judicious working of the forests and by the sale of their produce. Unless self-supporting, forest administration in India will never be permitted to develop in a healthy manner, but will be confined to half measures and spasmodic efforts, which can confer no real benefit upon the country.

544. It is true that a large proportion of the expenditure which has been incurred up to date may be regarded in the light of capital outlay which will produce a large revenue hereafter; but as already stated there is nothing in the circumstances of the district which would seem to preclude the annual outlay being covered by the annual revenue from the forests in their present condition. We have not here the task of covering large extents of bare rocky hills as in the dry districts of Ajmere and Merwara, or of Bellary and Anantapúr in this Presidency. In such cases Government must and does incur a heavy annual outlay in order to secure the future well-being of the people. A district situated like South Arcot ought not only to pay its way, but ought to provide a surplus for other less favored districts.

545. I have had the privilege of discussing with the local officers the prospects of an increased forest revenue, and the following suggestions are the result of these discussions. In submitting these suggestions, it will be necessary to review somewhat in detail the different sources from which revenue can be derived.

The estimate for the current official year on account of Imperial forests only, compared with the average actuals for 1881-82 and for the five years ending with 1880-81 may be stated as follows:—

—	Receipts.	Charges.	Deficit.
	Rs.	Rs.	Rs.
Average Actuals, 1876-77 to 1880-81	9,000	20,000	11,000
Actuals, 1881-82	13,000	17,000	4,000
Estimate, 1882-83	14,000	21,000	7,000

On the assumption that the annual receipts and charges of Jungle Conservancy will balance each other, it will suffice to provide an additional revenue of Rs. 6,000 a year in order to attain an equilibrium, and the measures which should be taken in order to attain this end will form the subject of the following remarks.

546. In the open forests, particularly in the Tiruvannámalai taluk, it will be possible to increase the timber operations, and to bring more timber of *Terminalia* and other useful kinds to depôt. These operations are estimated to yield an additional net revenue of Rs. 2,000 per annum.

547. Under the existing practice all firewood used by ryots for the manufacture of indigo and sugar is taken free from the Government forests, and the practice is based upon the order of the Madras Government, No. 27, of the 6th January 1871. It is perhaps a question to what extent this order may be held to apply to cases in this district, where manufactures requiring fuel are carried on on a large scale.* The firewood brought from Government forests to the large sugar factories established by Messrs. Parry and Co. pays seigniorage, and if the seigniorage could be levied on all wood used in the manufacture of sugar and indigo, the revenue might, I am informed, immediately be increased by Rs. 2,000 a year. A large quantity of dry wood (about 2,000 cart-loads annually, realizing 8 annas a load) is exported from the Gingee reserves, and, in addition to this, green wood has occasionally been cut which is sold at higher rates (up to Re. 1 per cart-load). These cuttings of green wood may be continued in Gingee and extended to other reserves, provided the cuttings are limited to the woods of inferior value such as *Dalbergia paniculata*, of which there are large quantities of good size, and the proportion of which kind in the forest it is desirable to diminish so as to give room for more valuable trees. There seems every prospect that the demand for fuel will increase. The Manager of Messrs. Parry and Co.'s sugar factory at Tiruvennanallúr informed me that his annual consumption of firewood at that factory alone amounted to 3,500 tons.† Much of this wood is at present obtained by cutting down babul and fruit-trees near villages, but this source of supply must eventually come to an end. The South Indian Railway is almost certain sooner or later to burn wood on a large scale. At the present time, even while coal (both Australian and English) is landed at an exceptionally low rate (Rs. 17 a ton at Negapatam and Tuticorin), it would probably be cheaper to burn wood. Taking a general view of all these circumstances, we are, I consider, justified in expecting that the consumption of firewood in this district will ere long increase very largely. It is therefore necessary that in forming and managing the wood reserves, the possible requirements of the railway and wood-consuming industries, apart from the needs of the villagers, should be taken into consideration; and I would strongly urge the suggestion already made that wherever possible compact areas of large extent be acquired and set apart for this purpose, and that every effort be made to get these areas stocked as rapidly as possible with complete forest.

In the Madras Presidency, more than in any other part of India, must it be considered the duty of the Forest Department to reduce the price of fuel for industrial undertakings, and for the requirements of the country generally. Hence in the South Arcot District it is a question of great practical interest to determine the annual yield per acre of Casuarina and babul plantations. In most cases the question whether Casuarina or babul should be grown will be settled by the nature of the soil. Nevertheless, in framing a general plan of operations, it is necessary to know the yield that may be expected from either class of plantations, and the capital outlay at which they can be produced.

* The following statement gives the areas under sugar-cane and indigo cultivation in 1881 in the different taluks. A considerable quantity of sugar is also made from Palmyra juice:—

Taluks.	Area under Sugar-cane Cultivation.	Area under Indigo Cultivation.	Taluks.	Area under Sugar-cane Cultivation.	Area under Indigo Cultivation.
	ACRES.	ACRES.		ACRES.	ACRES.
Tindivanam	187	7,177	Tirukoilúr	391	7,967
Tiruvannámalai	30	168	Kallakurchi	1,860	637
Villupuram	79	13,534	Vriddháchalam	241	3,291
Cuddalore	338	11,051	Chidambaram	159	2,110

† The consumption of fuel at the Nelikupam Sugar Factory, belonging to the same firm, is much larger, but at present they chiefly burn coal.

The plantations of babul and Casuarina have the great advantage of being nearer to the railway and to the chief centres of wood consumption than most of the natural woodlands. As regards babul, I can only recommend that Mr. Wooldridge should persevere in the plan, hitherto pursued by him with so much success, of taking up suitable pieces of waste land at the disposal of Government in the coast taluks which produce babul. Such pieces of land should be made reserved land and protected against alienation; but I would at the same time strongly urge that for strict protection and cultural operations only large blocks of compact shape be taken in hand.

As regards Casuarina, I am disposed to advocate that all suitable land at the disposal of Government along the coast between Cuddalore and the southern limit of the district be declared reserved land. Here the railway runs within a few miles of the coast, and it may be taken as granted that every cubic foot of wood here produced will find a ready sale. This would not interfere with the extension of private plantations, which at present are limited to Chingleput and those portions of Nellore and South Arcot, where it pays to send wood to the Madras market. Experience must show how far it will pay private enterprize to produce wood at prices sufficiently low to enable the railway to use it. At present the State should be cautious in alienating land which may enable it, by its own plantations, to reduce the price of fuel. Should private enterprize develop further in this direction, there will be no difficulty in giving up any land that may be required by private persons for Casuarina plantations.

Before however any large outlay is incurred on these plantations, the yield per acre must first be ascertained and the outlay required to produce the wood. For Casuarina the needful data can probably be obtained by a detailed examination of the Government plantations in the Nellore District, as well as of those in South and North Arcot; while for babul, the South Arcot and Trichinopoly plantations will probably yield approximate data. No time should be lost in setting on foot this enquiry, which must be entrusted to a competent officer, who should, for the time being, be relieved of other duties.

548. In Mr. Wooldridge's Jungle Conservancy Report for 1880-81, I have noticed a passage from which it would appear he contemplates that when the reserves are fully stocked and have been brought into such a condition that they can be worked, firewood and wood for agricultural implements should be granted free to the villages in whose limits the reserves are situated. On this subject, my opinion is that before any area is taken up for strict protection and improvement, the rights of Government in it must be settled, either under the Forest Act or otherwise, so that the area shall be either entirely at the disposal of Government or subject to well defined rights. Such rights must be scrupulously respected, but beyond this we should not go. On the Government lands outside the reserves, the ryots will continue to exercise the privileges hitherto enjoyed by them, but the reserves have been formed, protected, and improved by the agency of Government Officers, and at the expense of Government. Besides furnishing wood and cattle fodder, the improved condition of these lands will, in many respects, confer great benefits upon the people; and it seems only right that the people should pay for all produce consumed by them, beyond what they are entitled to by right. As a commencement the reserves which it is intended to improve must be closed against all cutting, but when they have improved sufficiently to be worked, the first aim must be to arrange the working so that some revenue shall be realized in return for the outlay incurred upon them. This will not however exclude the free grant of wood either to poor people or to enable the ryots to rebuild their houses destroyed by fire or other calamity. At first sight a different policy would appear to be more liberal and generous, but the result of such liberality and generosity would eventually be that the means at the disposal of Government for the efficient protection and improvement of the reserves would be crippled. This must by all means be avoided.

549. Matters would be different if it had been possible to constitute these reserves village forests in the true sense of the word. In that case they would have been protected and improved through the agency of the village communities

without causing any outlay to the State; and if this had been done, the village communities might justly use the produce of these forests, which to a great extent would be the result of their own exertions, without paying for it. But the Jungle Conservancy reserves in South Arcot are not village forests in this sense of the word, and forest administration in this Presidency must be much further advanced before the formation of such village forests can be attempted.

550. The South Indian Railway has been a large consumer of fuel, chiefly for brick-making,* and this wood, to a large extent, has been derived from old topes and fruit-trees past bearing sold by Government. These sales I am informed are often concluded by the subordinate Revenue Officials at rates below the real value of the trees.

It is for consideration whether Government topes, or trees in Government topes, should be sold without the sanction of the Collector or the District Forest Officer.† The preservation of these topes, unless the trees are perfectly useless, would, as a rule, be most beneficial, and the demand for firewood would then, to a greater extent, be supplied from the Government forests.

551. No grazing dues are at present levied in any Government forest or waste, although private proprietors, such as the Poligars of the Kalrayans, levy dues on all cattle coming for pasture to their forests. There seems no reason why grazing dues should not be introduced in South Arcot. It must be remembered that the pasture in the reserved forests, in spite of the present only partial protection, is already much better than in the adjoining waste lands, and that in many places it will still further improve. At the commencement, reserved forests must be closed against cattle, but in many places it will be possible to permit grazing after the forest growth has advanced sufficiently, and it is only right that the people should pay for the improved pasture provided for them by the action of Government.

552. Grazing dues should at once be levied on all cattle which it may be found expedient to admit in Imperial reserves, and if this is sanctioned, a revenue of Rs. 1,200 may be realized the first season. It will however be necessary to exercise some care in making the needful arrangements. For instance, it would not further the interests of conservancy to admit cattle indiscriminately on payment of certain rates. A contract should be made with influential men in the vicinity of the reserves for farming the grazing area; and the continuance of these contracts should be made to depend on the successful co-operation of the contractors for the exclusion of fire from the reserves and the general protection of the forest.

553. Under the late orders (*a*) of the Government of Madras, which permit the collection of minor forest produce in Government forest by the hill tribes on behalf of Government, the sale of gall-nuts—the fruit of *Terminalia Chebula*—may be expected to give an additional revenue of Rs. 800 a year as a beginning. Hitherto these myrobalans have been collected free by anybody who chose to go into the forests. Large quantities of vel-vélam bark ‡ (*Acacia leucophlœa*) were formerly collected free of tax in most taluks, while in Kallakurchi it pays a seigniorage of Rs. 2-8-0 a cart-load, and in the adjoining taluk of Attúr in the Salem District, Rs. 5 a cart-load is levied. There seems no reason why the higher rate should not be made applicable to the whole district, and if this were done an additional revenue of Rs. 500 per annum is expected to be realized, not immediately, but after some time. The bark not having been taxed, the large trees have, in many places, been extirpated, but fortunately young growth of this tree is found to a considerable extent in the Vriddháchalam and Kallakurchi taluks. The bark of avaram (*Cassia auriculata*) which was formerly collected free of charge in all but two taluks, viz.,

(*a*) No. 1612, dated the 2nd August 1879.
No. 841, dated the 21st July 1880.

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* During construction, the Panruti Railway brick-fields, in Cuddalore taluk, consumed 800 tons of wood per month.

† A recent order by the Collector in the *South Arcot District Gazette* enjoins a more strict supervision of the sale of trees.

‡ The firm which has the arrack contract for this and the adjoining districts consumes, in its South Arcot distilleries, 600 cart-loads of vel-vélam bark a year, but at present most of this is imported from other districts.

Tiruvannámalai and Kallakurchi, and in these paid only at the rate of 12 annas per cart-load, now pays throughout the district the same rate as in the adjoining districts, viz., Rs. 2 per cart-load. This change, I am informed, was introduced in July 1881.

554. The rent of fruit-trees standing in forests is at present credited to Land revenue, but this item should certainly be credited as Forest revenue. Major Campbell Walker informs me that he has repeatedly represented this matter. From this source, Rs. 1,000 a year is expected to be realized. The Forest Officers are in charge of the forests, and under their management the revenue realized from this source can doubtless be increased.

The following is a summary of the additional items of revenue which it is believed may be expected :—

	Rs.
I. Increased timber operations	2,000
II. Seigniorage on firewood	2,000
III. Grazing	1,200
IV. Minor produce	1,300
V. Rent of fruit-trees in forests	1,000
Total ...	7,500

555. If these suggestions are accepted, an equilibrium between forest receipts and charges will be established, but this must be regarded merely as the first step; for if it is intended to carry out the proposals of the present report, a very much larger expenditure than at present will be incurred, to cover which a large increase of receipts will be needed.

Organization.

556. In one respect the organization of the forest business is in a satisfactory state. The District Forest Officer is the Assistant to the Collector for all forest matters, and conducts his business in subordination to the Collector. He has charge of the forests under Jungle Conservancy, as well as of Imperial forests. This is as it should be. But otherwise, the organization is extremely complicated, and if it is intended to manage the forests of this district in an efficient and economic manner, it must be simplified. Under existing arrangements, the District Forest Officer submits two separate sets of accounts, and of monthly and annual reports. The accounts and reports regarding Jungle Conservancy are submitted to the Collector, and orders upon them are passed by the Board of Revenue, while the reports and accounts regarding Imperial forests are sent to the Conservator. The classification of items of receipts and charges is different in the Jungle Conservancy and in the Forest accounts, and the arrangement of the periodical reports is also entirely different. The annual report for Jungle Conservancy submitted through the Collector to the Board of Revenue is extremely voluminous, comprising a detailed statement of receipts and expenditure for each forest tract, which in the report for 1880-81 extends to ten sheets of foolscap. It is further accompanied by a detailed list of plantations and topes and a list of reserves, filling six and seven sheets, respectively, as well as by seven detailed figured statements.

The annual report submitted to the Conservator is less voluminous, but the system of double sets of returns, reports and accounts absorbs a great deal of the District Forest Officer's time, and employs a large office establishment.

557. The Imperial reserves, and those of the Jungle Conservancy, have the same character, are stocked with the same classes of trees, and require the same system of treatment. The villagers living in the vicinity of the Imperial reserves will derive the same advantages, through their improved condition, as those who reside in the vicinity of the adjoining Jungle Conservancy lands. The two classes of reserves may originally have been formed with different intentions, but, as a matter of fact, there is no difference of any practical importance between them. It is true, one staff is sanctioned for the charge of the Imperial forests and another for the care of Jungle Conservancy lands, but the duties of these two classes of officers are of the same character, and the maintenance of a double staff would

be a source of still greater expense and complication, had not Mr. Wooldridge, wherever practicable, amalgamated the staff by placing both Imperial reserves and Jungle Conservancy lands in the hands of one man. Thus the Ranger of the Tiruvannámalai Imperial forests has also charge of the Jungle Conservancy reserves in that taluk; and the Forester in charge of the Gingee reserves has charge also of an adjoining Jungle Conservancy tract. In the same manner the Superintendents of the Jungle Conservancy lands in the Kallakurchi, Tirukoilúr and Tindivanam taluks have charge also of Imperial reserves in those taluks. Practically, therefore, the amalgamation of Imperial and Jungle Conservancy management has already been effected, and it only remains officially to recognize this amalgamation, and to abolish the double system of reports and accounts. This amalgamation has now been sanctioned, and under it the District Forest Officer will remain the Assistant to the Collector for all forest matters; but the difference will be this, that the control in professional matters over both classes of lands will rest with the Conservator of Forests.

The amalgamation of the two branches of forest business will simplify the whole administration, and will save a great deal of time and expense.

Taluk Forest Officers to be subordinate to Tahsildars.

558. It has already been mentioned that steps must be taken to enter the existing reserves, both Imperial and Jungle Conservancy, in the Village Registers. In several instances, Tahsildars have informed me that they had received no official intimation of the areas constituted as reserves, and if this is so, it must obviously lead to inconvenience. It would appear that, although the Collector himself originally directed the first formation of the Jungle Conservancy reserves, sufficient steps were not taken to cause these areas to be recognized by the subordinate Revenue officials as lands reserved under the orders of Government. In other respects also it has appeared to me that, in regard to Jungle Conservancy lands, as well as to Imperial reserves, there has not always been that ready co-operation between the taluk officials and the local Forest Officers, which is essential to ensure efficient forest administration. After fully discussing the subject with the Civil and Forest Officers, I have come to the conclusion that in this district the plan should be tried as an experiment of placing the local Forest Officers of a taluk in subordination to the Tahsildar, in a manner analogous to that under which the District Forest Officer is subordinate to the Collector. The District Forest Officer will be the Assistant to the Collector for all forest business, his office will be a branch of the Collector's office, and all orders issued by the District Forest Officer will be issued in the name of the Collector. These orders should, as a rule, be addressed to the Tahsildars, to whom the local Rangers and Foresters will be subordinate.

It is unnecessary in this place to enter into a detailed discussion of these arrangements, and it will suffice to state that the success of the organization here suggested to be tried by way of experiment will, to a great extent, depend upon the establishment of a regular system of weekly reports. The chief Forest Officer of the taluk must be required to submit, every Saturday, to the District Forest Officer a summary report of all his proceedings during the week, a copy of this report being, on the same day, despatched to the Tahsildar, to whom he is subordinate. This system of weekly reports, if properly carried out, will keep the District Forest Officer, as well as the Tahsildar, informed of all that has transpired in forest matters in the taluk; and will enable them, under the rules which should be laid down by the Collector, to take such action as circumstances may require.

This system will, if adopted, secure the co-operation of the Tahsildar in all forest matters without in any way weakening the control of the District Forest Officer over his subordinates.

The South Arcot Forest Officer has charge, besides the forests of his own District, of the Thenmalai hills and that portion of the Javadis which overhangs the Tiruvannámalai taluk, although these forests are in the Tirupatúr taluk of Salem. With these forests the Tahsildar of Trinomalai has no concern, and the Ranger or Forester in charge should be directly under the orders of the District Forest Officer. A similar arrangement may be found convenient in the case of the reserves on the

Gingee hills (27,000 acres), which have been under protection during the last twelve years, and in which there are no villages. And the local Forest Subordinates of any other large tracts, remote from villages, should be directly under the District Forest Officer's orders.

CHAPTER XI.

TINNEVELLY.

559. I arrived at Tinnevelly by train, coming from Tindivanam in South Arcot on the 7th February, proceeded to Singampati on the 8th examining the Shermá-devi reserve on the way; on the 9th proceeded to the ghât forests at the head-waters of the Támbraparni *viâ* the Vánatirtam waterfall, and camped at Mel Uláru above the Katalaimalai estate. On the 10th proceeded to the Cinchona plantation and the forests on the Péyár river below the Agastiya peak, camping at Kíl Ulláru. On the 11th descended to the Kariár river, and crossed to the Sarviyár valley, and after ascending this valley to Avulapattikádu, reached Pápanásam that evening. On the 13th went from Pápanásam to Courtallam; on the 14th examined the ghâts above Courtallam and returned to Tinnevelly on the 15th. On the 17th went to Tuticorin, examined the Melavittan reserve, south of the station, on the 18th, and the jungles on the coast in the Ettiyápuram Zemindari on the 20th and left Tuticorin by train for Madura on the 21st. On the trip to the forests above Singampati I was accompained by Mr. Pennington, the Collector, the Conservator, and Mr. Hayne, the District Forest Officer. On the trip to Courtallam Mr. Pennington accompanied me. At Tuticorin I stayed with Mr. von Donop Hardinge, the Sub-Collector.

Climate.

560. As regards rainfall, we must distinguish between the ghâts and the plain country. On the crest of the ghâts, at an elevation of 6,200 feet above sea-level, on the Agastiya peak, meteorological observations were made during a series of years under the direction of John Allan Brown, Director of the Trivandrum Observatory, of which I have obtained the details for the years 1855 to 1860 through the kindness of Mr. W. Dumergue, Assistant Resident at Travancore. These observations are believed to be reliable, and I give the figures below as I received them.

Month.	1855.	1856.	1857.	1858.	1859.	1860.
January	..	6·004	9·085	8·375	6·028	1·660
February	..	3·235	0·842	2·338	3·122	1·870
March	..	2·990	2·070	3·585	6·888	0·370
April	..	6·607	4·851	4·740	20·406	0·440
May	..	33·243	46·713	60·628	8·184	4·520
June	..	28·600	33·766	18·711	44·370	17·780
July	10·044	27·785	31·994	25·490	46·707	22·800
August	15·718	23·528	31·365	9·830	21·830	22·760
September	9·071	8·385	12·405	22·590	13·560	25·350
October	19·264	20·683	21·970	53·925	21·938	11·710
November	12·841	15·474	10·995	19·315	23·550	8·550
December	7·364	12·709	4·180	7·188	3·950	20·570
Sums ..	74·302	189·243	210·236	236·715	220·533	138·380

The annual mean of 5 years (1856 to 1860) is nearly 200 inches. At the foot of the hills the rainfall is, at Ambásamudram 35, Tenkási 38 inches. Further north, where the belt of hills between the crest of the ghâts and the western coast is much broader, the South-West Monsoon is less and hence the rainfall at Srívilliputúr, 8 miles from the foot of the hills, is only 25 inches. In the centre of the district the mean annual rainfall at Tinnevelly is 29 and at Sátúr, in the northern and drier part of the district, 21 inches. Along the coast north and south of Tuticorin, extends an exceedingly dry belt, the mean annual fall at Tuticorin being only 19

inches. The distribution of the rainfall during the seasons appears from the following figures showing the mean monthly rainfall at three stations :—

Month.	Agasteermalai.	Tinnevelly.	Tuticorin.
January	6·23	1·45	1·05
February	2·28	0·90	0·47
March	3·18	1·54	0·79
April	7·40	2·05	1·47
May	30·65	1·48	0·69
June	28·64	0·63	0·13
July	30·95	0·26	0·24
August	21·86	0·55	0·39
September	16·45	0·93	0·58
October	26·04	6·20	3·50
November	15·57	10·08	7·45
December	9·71	2·93	2·21
Total ..	198·96	29·00	18·97

Along the crest of the ghâts rain falls almost throughout the year, but the fall is heaviest from April to December during both the South-West and North-East Monsoons. Lower down also on the slopes of the hills the climate is moist and rain falls during most months of the year. In the plains a long hot dry season from January to September is succeeded by a short North-East Monsoon from October to December.

It may be said that of the total area of the district, the narrow belt of hills at its western border, with an area of about 700 square miles, has a moist climate, while the climate of 4,681 square miles in the plains is exceedingly dry.

The result of these two different climates is, that in the hills, even at low elevations, there is dense forest, much of which is evergreen, and that out in the plains, the natural growth of trees and bushes is exceedingly scanty. While in the Nellore District the forest on the coast at Sríharikót is similar in character to the forest at the foot of the Eastern Ghâts, with many species the same in both—the dry thorny jungle on the coast at Tuticorin has hardly a species in common with the luxuriant forest of the ghâts in the same district.

Objects of Forest Conservancy.

561. The task to be accomplished by Forest Administration in the Tinnevelly District may be defined as follows :—

First.—The protection of the ghât forests in order to secure the continuance of the present water-supply in the Támbraparni, Vaippár and other rivers, upon which the irrigation and hence the prosperity of the district depends.

Second.—The maintenance of the fuel supply and the increase of fodder during seasons of drought for the towns and villages in the plain country, and the improvement of those waste lands which can be set apart for forest growth.

562. Of these two objects, that named first is out-and-out the most important, and it will therefore be considered in the first instance. The report of the late Forest Committee, consisting of the Collector, Mr. Pennington, and two Forest Officers, Major Campbell Walker and Mr. Hayne, appointed by Government to select the reserved forests to be formed on the ghâts in this district, justly states that the area irrigated from rivers (167,000 acres) with an annual assessment of 15 lakhs chiefly depends upon the water-supply which these rivers derive from the eastern slopes of the ghâts, and it is the concurrent testimony of all officers who have had practical experience of the district, that the forests at the head-waters of these rivers must be protected in order to ensure the water-supply and to maintain this irrigation.

563. The total area of the Tinnevelly District is 5,381 square miles, and may be subdivided as follows :—

	ACRES.
Zemindari and Inam lands	1,127,672
Government lands occupied	1,387,626
Do. unoccupied	928,542
Total Area of District ...	3,443,840

The population in 1881 was 1,700,000 or 310 on the square mile. A reference to Statement I, appended to the report, will show that, excluding the exceptional districts of Tanjore with 583 and Trichinopoly with 367, which owe their dense population to the Cauvery river, Tinnevelly stands fourth, viz.,—

Malabar	with	410	souls on the square mile.
South Arcot	,, ...	372	,, ,,
Chingleput	,, ...	345	,, ,,
Tinnevelly	,, ...	310	,, ,,

Considering the exceedingly dry climate of the district beyond the narrow belt of the ghâts, this high rate of population is most remarkable, and it is due entirely to the irrigation which this district derives from the Támbraparni and the other rivers. And it is also owing to this irrigation that population has not diminished since 1871, and that the famine has enriched the people instead of impoverishing them.

Besides the four northern districts, those on the Western Coast, and those protected by the Cauvery, South Arcot and Tinnevelly are the only districts which show an increase of population since 1871. In Tinnevelly the increase was only in the river irrigated taluks, in the others there was a decrease.

In Fasli 1291 (1881-82), the Government occupied lands were classed as follows :—

	ACRES.
Wet	177,022
Dry	811,852
Waste	398,752
Total occupied Area ...	1,387,626

Although the area under wet crops is much smaller than that under dry crops, the yield, if both classes of lands bore grain crops, would be about equal. Of the dry lands of the Tinnevelly District, a large area however does not produce grain but cotton.

564. Of the occupied wet lands, a small proportion (28,000 acres) is irrigated from rain-fed tanks, while the areas, irrigated from rivers, are stated by the Forest Commission as follows :—

River.	Area.	Assessment.
	ACRES.	RS.
Hanumanadi	1,944	12,920
Nambiyár	9,797	73,773
Támbraparni	124,781	1,230,402
Vaippár	30,786	168,568
Total ..	167,308	1,485,623

These figures, though not strictly accurate, are sufficiently so to give an idea of the relative importance of these four rivers.

According to the more correct data recorded in the first part of the present report, the area classed as irrigated from the Támbraparni river is 105,900 acres, of which 64,000 acres bore two crops in Fasli 1290, so that in that year the area actually irrigated was 169,549 acres, taking first and second crops together.

565. It has already been said that the irrigation of these rivers mainly depends upon the water-supply which they derive from the eastern slopes of the ghâts. What I mean is this: of the total catchment area of the Támbraparni river, above the Srívaikuntham anicut, 1,389 square miles are in the plains and 350 square miles in the hills. The mean annual rainfall on the area in the plains may

be estimated at 30, and that in the hills at 100 inches. Thus it may be estimated that the mean annual rainfall on the catchment area amounts to 96,808 millions of cubic feet on the plains and 81,312 millions on the hills. The quantity which falls upon the hills requires a longer time before it reaches the main river than that which falls upon the plains, and, in addition to the greater distance, its down-flow is retarded by the forest. But when the question is put to the test of experiment, it will probably be found that, owing to the higher temperature and the drier air, evaporation in the plains is so powerful that a much smaller proportion of the rainfall reaches the main river than is the case in the hills. As explained in paragraph 204 of this report, the mean annual discharge of the river at the Srívaikuntham anicut is 60,000 millions cubic feet, and the quantity drawn from it above that anicut, including waste, is estimated at 20,000 millions cubic feet a year. The total quantity of 80,000 millions cubic feet is the result of 96,808 millions of cubic feet estimated to fall on the plains and of 81,312 millions cubic feet estimated to fall upon the hills; and I believe that the greater part of the annual supply available for irrigation is due to the rain which falls upon the hills. It will be part of the duty of the Officer charged with the experiments proposed in an earlier chapter of this report, to determine the proportion of the rain which falls upon hills and plains and otherwise upon surfaces of different character, that finds its way to the rivers and can be utilized for irrigation, and nothing more need be said on the subject at present. But on the assumption that the rainfall upon the hills is the more important, a comparison will here be made of the catchment area in the hills and the area irrigated by each river.

566. The catchment area in the hills of the Hanumanadi is in Travancore territory, which here overlaps the ghâts and comprises about six square miles on the eastern face south of Mahéndragiri. The forests in this tract have been much broken up by cultivation; they are being destroyed rapidly, and the water-supply in that river is uncertain and precarious.

The catchment area in the hills of the Nambiyár may be estimated at 50 square miles, so that one square mile of this catchment area corresponds to 196 acres of land irrigated by the river.

The head-waters of the Támbraparni spread over a length of ghâts of 56 miles north and south of the Courtallam gap, and the total catchment area in the hills may be estimated at 350 square miles, of which 24, north-west of Tenkási, are in Travancore territory. The irrigated area is 124,781 acres, so that the rainfall on one square mile in the hills corresponds to an irrigated area of 318 acres.

The Vaippár takes its rise further north, where the south-west monsoon is much less heavy and much less continuous. The catchment area in the hills of this river may be put down as 300 square miles, of which about 30 square miles are in Zemindari lands of the Madura District. The irrigated area is 30,786 acres or 102 acres to one square mile of catchment area in the hills.

567. The catchment area in the hills of these three rivers, as here estimated, is as follows:—

Nambiyár...	50	square miles, irrigating	9,797	acres.
Támbraparni	350	,, ,,	124,781	,,
Vaippár	300	,, ,,	30,786	,,
Total ...	700	square miles, irrigating	165,364	acres.

Of this area, only 559 square miles are Government land, the remainder is in Travancore and in Zemindari estates, and on this area Government exercises no control at present. These figures are mere estimates and they are subject to correction on the settlement of the Zemindari boundaries in the Tinnevelly District.

It is not possible to prove mathematically that the large irrigating power of the Támbraparni river is mainly due to the forests which clothe the higher slopes of the ghâts, but it is most probable that, if these forests were destroyed, the water would come down in a number of destructive freshes, instead of filling the river during a period of ten months in the year. The data, recorded in paragraph 204 of the first part of this report, showing the height of the water at Srívaikuntham, Tenkarai

taluk, the lowest anicut in the river, during each month in the year, and the average monthly discharge of the two channels which leave the river above that anicut, will show how evenly the water-supply is distributed over the greater part of the year. This is due to two causes, the even rainfall on the ghâts during nearly all seasons and the large extent of dense forest which clothes the hills.

568. The necessity of energetic action in this respect was fully recognized by Mr. R. K. Puckle, while Collector of the Tinnevelly District. In a letter addressed to the Conservator on the 30th September 1867, he wrote as follows :—

"The prosperity of the river-irrigated section of Tinnevelly, extending through five taluks, from the Western Ghâts to the sea, is dependent on a continuous flow of water in the rivers that rise on the Western Ghâts. Now this continuous flow has notably decreased of late years, and the decrease commenced with the destruction of much of the forest that formerly clothed the ghâts and protected the heads of the streams ; the rich shola land in the ravines down which the streams descend, attracted coffee planters who destroyed the magnificent timber and thus let in the wind which has extended the mischief done by the axe. Thousands of trees lie prostrate, and the coffee gardens, as might be expected, are mostly wind-blown and useless. Where the ground was once moist continuously, it is now parched and dry, and the courses of the numerous little rivulets that once fed the larger streams are now mere rocky nullahs, without a drop of water in them.

"The mischief, however, is done so far and cannot now be repaired, but what we can do is, to conserve the remaining forest most carefully, and see if we cannot increase the volume of water in the streams. Almost all the streams descend the ghâts in the Tenkási and Ambásamudram taluks between Courtallam and Kalladakurichi. The area to conserve is thus very limited, and in the Tenkási taluk I have visited every village and have made most careful arrangements. The people themselves are unanimous in their wish for conservancy, as even at the foot of the hills they now begin to suffer, and lower down the streams there is always an outcry for water."

And he added that, with the ryots' consent, he had prohibited all cultivation on the hills, except coffee, all charcoal-burning and firing the grass on the hills, and that cattle-grazing and firewood-cutting had been restricted to certain limits defined for each separate village.

569. Mr. Puckle did not altogether, in this respect, initiate a new line of policy, for his predecessors, Messrs. Bird, Eden, Montgomery and Thomas had, since 1837, prohibited dry cultivation on the slopes of the hills, "as it tended to the clearing of the forests which rendered the mountains bare of trees and thereby prevented the clouds from descending on the hills during the monsoons ; thus resulting in a scarcity of rain." While, however, his predecessors hoped to increase the rainfall by promoting the conservancy of the forests, Mr. Puckle was guided in his action by more correct views regarding the effect of forests upon surface drainage. But though the ryots in his time may have consented to discontinue cultivation on the hills, they did not formally relinquish the pattas which they held, and hence, of late years, under Mr. Puckle's successors, many plots of land have again been brought under the plough by the old patta-holders, some of whom had continued to pay assessment, while others had discontinued doing so. So that except in the vicinity of Courtallam, where Mr. Puckle had fixed a line, above which the forest was really protected, the measures taken by him have had no permanent effect.

570. It is due to Mr. Pennington, the present Collector, and to Colonel Beddome, the late Conservator, to quote the following extracts from the reports regarding the protection of the ghât forests submitted by them to Government in March 1878 and embodied in G.O., No. 1500, dated the 13th September 1878 :—

Colonel Beddome writes as follows :—

"The district had a rude example of what a flood can do on the 18th of last December, and I understand that the damage to bridges, roads and tanks is not less than 1½ lakhs of rupees, besides great damage to crops and salt. It would be a bold assertion to say that the small felling, which has already taken place, added much to the volume of this flood ; but I visited the tract to see the effects, and I have no hesitation in saying that, to a certain degree, its intensity must have been increased. The splendid leafy canopy in these evergreen forests is so dense that it rains for some minutes before any drops come through, and then it comes down so lightly that it is soaked up in the soft humus and debris that forms the upper stratum of the surface soil. When the trees are all felled and burnt much of this humus and debris is also burnt, and the rest is swept down by the first heavy rains ; after this, whenever there is violent rain, it rushes off down the sides of the mountains, forming numerous sluices

where nothing of the sort existed before. If all the rest of the Katalaimalai forest is felled, I anticipate that the result will be very serious. I do not know whether it is too late for Government to interfere, but I believe it would be a good policy to pay a very large sum to save the remainder from destruction.

"This, however, is not all; the whole of the Singampati forests are threatened, and I believe doomed, if Government do not interfere; this tract is variously estimated at from 100 to 200 square miles (all superb evergreen forests), the boundaries not being known or demarcated; if this or any great portion of it is felled, it will be an act of vandalism that will be bitterly repented when it is too late, and it will be impossible to say what ruin it will not bring on the Tinnevelly District.

"Nearly all the forest in this district above a certain elevation being of the evergreen description generally called "shola," and the surface soil consequently more or less moist, fire never enters it; consequently fire-traced reserves are not of importance here for climatic considerations as they are in our dry districts; the lower portions of the mountains are, however, more or less clothed with dry deciduous forest where reservation and fire-tracing is of importance for the supply of timber, as Vengay, one of the most favorite timbers in this district, and other valuable sorts only affect these tracts and never grow in the moister forest above. Some years ago Mr. Puckle, when Collector, introduced a very good system of conservancy here; he cut a broad ride or fire-trace a little up the mountains running parallel with the base of the hills; all below this ride was considered communal forest and open to free felling, grazing, &c.; above this ride parties with free licenses or firewood tickets were not admitted; grazing was also excluded, and fire kept out; in fact it was a reserved forest; this system was particularly adapted to this district and was answering exceedingly well, and the reserved tract above the ride or fire-trace was showing most marked improvement, so much so that almost every one in the district remarked the rapid growth of, and change for the better in, the character of the forest above this ride."

Mr. Pennington forwarded the report with the following remarks :—

"I have really nothing to add to Colonel Beddome's report. It appears to me to be absolutely conclusive as to the very urgent necessity for immediate action if the magnificent irrigation of the Támbraparni river is not to be utterly destroyed, and I do *most earnestly* trust that such action may be no longer delayed. It is a matter of immediate necessity that we should, by some means or other, secure the control of the Katalaimalai, and ultimately of the whole Singampati Forest. I hope I am not apt to be too confident in expressing my opinions, and, indeed, on many of the problems of administration I am doubtful enough; but on this particular subject I may claim to speak with some confidence, for I am perfectly familiar with the whole country affected, and have studied the question both on the spot with the aid of all the local information obtainable, and also in the Office of the Board of Revenue, most anxiously and continuously for the last eleven years or more, and I am satisfied that the delay that has occurred has already been the cause of incalculable damage, and that, if nothing is done soon, it will not be very long before the ruin of the river valley will have been completed; and we in Tinnevelly, at any rate, shall have to write 'too late' on our forest legislation.

"It is only those who have actually seen the progress of coffee cultivation from its first small beginnings, just about the time I first joined this district, who can form an adequate idea of the ravages the planters have already committed, and of the imminent risk to this district if clearings are permitted at the same rate on the eastern slopes of the ghâts."

The Board of Revenue in forwarding this report to Government in their Proceedings, No. 1239, dated the 9th May 1878, observed :—

"In his inspection report, dated 3rd November 1876, Colonel Beddome drew attention, in somewhat similar, though less forcible, language, to the mischief which he considered would result from the extension of coffee cultivation in these forests, but the only notice taken of the subject in G.O., dated 21st February 1877, No. 759, was the remark in paragraph 7, that the Government learn with satisfaction that coffee planting is extending as mentioned in paragraph 27 of the Conservator's letter.

"From this remark the Board infer that the Government are far from sharing Colonel Beddome's forebodings, but they respectfully submit that the subject is one which deserves anxious and careful consideration. If the views so strongly held by the Conservator and the Collector are even approximately correct, the interests of cultivators paying a revenue of about ten lakhs of rupees are most seriously endangered. On the other hand, the benefits accruing to a district and to the Presidency generally from the extension of the Cinchona, Tea and Coffee-planting industries, are far too great to be lightly sacrificed and general prohibition at any rate should not be resorted to until it has been clearly ascertained that the object aimed at cannot be secured by merely regulating the conditions under which forest land is allowed to be taken up by planters. There will always be a mean between wholesale exclusion of the feller and planter and wholesale neglect of forest conservation which no theories can fix, but which must be decided in different localities according to their particular circumstances; but in any case it is desirable that Government should be armed with full powers to act, when a decision has been arrived at, and the Board would

strongly urge that steps be at once taken for the passing of a Forest Act for this Presidency or the introduction of Act VII of 1878."

571. In the present report it will be recommended that no more land whatever be alienated on the eastern slopes of these ghât forests for coffee or any other cultivation. This measure is rendered necessary by the peculiar circumstances of the case, which are quite different from what they are on the Nílgiris, Palnis and other hill ranges in this Presidency. We have here a narrow belt of hills, mostly with steep slopes, of which a small portion only is clothed with evergreen forest, and we have an exceedingly hot and dry climate in the plains below, which plains nevertheless along the rivers maintain an exceedingly large population chiefly depending upon the irrigation furnished by these rivers.

It is, as a matter of course, most important to encourage the growth of coffee and other paying crops, and to promote the settlement of Europeans on the hill ranges of this Presidency. But in the case of these ghâts the benefit to be derived from extending such cultivation would be insignificant as compared with the damage that would be done if the water-supply available for irrigation in the plains were diminished. Moreover, there seems good ground for apprehending that, with few exceptions, the eastern slopes of the Tinnevelly ghâts are not well suited for coffee. It is not likely that more money will be invested in coffee for a long time; the people have lost too much by it. I do not venture to form an opinion as to how far they are suited for tea and cinchona, but so much seems clear that the first object to aim at must be to protect, improve and extend the narrow forest belt upon which, according to our present knowledge, the prosperity of the district in a great measure depends. As it is, of this narrow forest belt, a large portion is the property of Zemindars and not at present under the control of Government.

Ghat Forests—their Character.

572. The forest vegetation of the Tinnevelly ghâts has been admirably described by Colonel Beddome in his inspection reports, and it will here suffice to indicate the principal classes of forests which may be distinguished :—

First.—Deciduous forest, consisting of scattered trees with high grass between the trees. These open forests and grass lands occupy all drier slopes up to an elevation of 2,000 feet and the principal trees are: *Careya arborea, Buchanania latifolia, Anogeissus latifolia, Pterocarpus Marsupium.* At higher elevations *Dillenia pentagyna* and *Eugenia Jambolana* are more common.

The following are the principal trees of the deciduous forest noted in the Kariár and Sarviyár valley on the 11th February: *Anogeissus latifolia, Buchanania latifolia, Briedelia retusa, Careya arborea, Phyllanthus Emblica, Grewia tiliaefolia, Terminalia bellerica, Pterocarpus Marsupium, Mallotus philippinensis, Nauclea cordifolia, Chloroxylon Swietenia, Diospyros Melanoxylon,* with here and there underwood of *Cycas* and *Dodonaea viscosa.* On the grassy slopes above 3,000 feet, between the Péyár and Kariár rivers, the following trees were noticed on the 10th :— *Dillenia pentagyna, Careya arborea, Phyllanthus Emblica, Zizyphus xylopyra.* Near the foot of the hills, on the outer slopes, there is a good deal of *Givotia rottleriformis* with *Protium caudatum* and *Erythrina indica.*

In this class of forest teak is found, but it only occurs here and there, on the outer hills and in the outer valleys, the most noteworthy localities being the low hills west of Kalakad and the outer hills on both sides of the Támbraparni and its chief feeders the Sarviyár and Kariár, but only up to a certain point. In the Támbraparni valley the upper limits are the falls of the Vánatirtam. Up the Sarviyár teak extends to a point about four miles from the junction with the Támbraparni, and higher up *Anogeissus latifolia* takes its place. In this class of forest, the trees lose their leaves in March and are generally leafless until May; the grass dries up and generally burns during that season.

Second.—The evergreen forests, consisting of a great variety of trees, among which *Mesua ferrea* (nang) and several species of *Hopea,* known by the generic name

of kong, are the most important. Other useful trees are *Gluta travancorica* (shenkurani), *Canarium indicum* (kundrikam), and puwan, a tree with pinnate leaves. *Vitex altissima* (maili) is chiefly found in the evergreen, but also occurs in the deciduous forest. Besides these, Colonel Beddome in his reports mentions several others, the timber of which is said to be valuable, though they are not known to the people.

Stretches of evergreen forest are found along the streams at the bottom of valleys, but the great mass of this class of forest commences at an elevation of about 2,000 feet and stretches upwards to near the crest of the range. Near the summit of the hills and along the higher slopes of the range, vast extents are covered with irul, a bamboo with large ovate fruit, *Beesha travancorica*, forming dense, impenetrable thickets 10 to 15 feet high, from which stand out scattered trees of *Vernonia Eugenia* and a few other kinds.

It must not, however, be imagined that the whole of the hills are clothed with forest. There is much bare rock and there are extensive tracts where the rock is close under the surface, covered only with grass and a few scattered trees. Much of the forest has also been destroyed by extensive clearings made by the Malai Arasans and by coffee planters. Between Pápanásam and Courtallam the outer slopes up to a considerable elevation are almost bare, and only near Courtallam have they been protected and are fairly clothed with forest. North of the Courtallam gap the lower slopes of the whole line of ghâts are generally bare, and there is dense forest only in valleys and near the crest of the range.

573. The evergreen forest and the forest of Beesha are certainly the most useful for regulating the water-supply of the river. As Colonel Beddome says, the dense leafy canopy of the evergreen forest breaks the downpour of the rain, and the cover of the leaves on the ground and the network of roots in the ground lead a larger proportion of water into the soil. Every effort should be made to increase the area of the evergreen forest on these hills. Its extent is limited, and every time the fire passes through the adjoining grass lands, some trees on the edge of the evergreen forest are killed and its area is diminished. On the other hand, when fires are excluded, the evergreen forests gradually extend into the grass lands. These observations have led us to the conclusion that what is required most of all in these higher hill forests is to protect them against fire.

Outer Boundaries and Enclosures of Private Land.

574. Before submitting definite proposals as to how this may be accomplished, it will be well to state what has been done for the demarcation of these forests.

At the foot of the hills a line has been demarcated by the Revenue Survey, as the limit of culturable land in the plains The land above this line is at the disposal of Government as far as it is not included in private estates. These private estates are numerous and the proprietors are Zemindars, Inamdars and holders of pattas. The boundaries between these private estates and the Government land have not yet, in all cases, been finally settled and demarcated, and herein consists the chief difficulty in establishing an efficient protection of these forests. As long ago as November 1876, Colonel Beddome gave a list of the private forests which dovetail with the Government forests all along the ghâts, reporting that none of these had then been demarcated, and urged that demarcation should not be delayed. On the west side this belt of forest is bounded by the territories of Travancore State, and the boundary line between British and Travancore territories has lately been settled in most places. There remain, however, a number of minor differences, regarding which no final settlement has yet been effected. As a rule, the principle has been observed to run the boundary along the line of watershed, but in several cases Travancore has large tracts of country on the eastern slopes of the hills, while in several instances considerable areas of forest on the western slopes, formerly held to be British territory, have been given up.

The most important tracts belonging to Travancore on the eastern slopes are Shenkóta, which extends into the Tinnevelly plains north-west of Tenkási and includes forest estimated to cover twenty-four square miles, and Panagudi, a tract

measuring about six square miles, on the eastern slopes of the hills south of Mahéndragiri. As protection of the forest in the tract last named is considered necessary for the maintenance of the water-supply in the Hanumanadi, which furnishes some irrigation, though uncertain, to the southern part of the Nángunéri taluk, the question of leasing it was considered and discussed with the Travancore Government; but the result of the correspondence has been that it was considered preferable to accept the offer made by that Government to conserve the forest on the eastern slopes of the hills through the agency of their own Forest Department. North of Mahéndragiri peak the boundary line, instead of being carried along the watershed, has excluded a large tract of dense evergreen forest, and the needful steps have, I understand, been taken to ensure this mistake being rectified.

575. The total area of Government land above the line demarcated by the Revenue Survey measures 559 square miles, and within this area a number of blocks, comprising the upper slopes of the hills, have been selected by the Forest Committee and proposed to be declared reserved forest. The proposals of the Committee have been generally approved by the Government in their Orders of the 11th February 1881. In the entire area, above the present surveyed limits, the Committee proposed that no extension of cultivation should be permitted, except in tracts specially selected and notified.

In the blocks proposed to be reserved, which are separated from the outer or unreserved forest area by an inner line, running across the slopes, it was found on inquiry that no rights of grazing, and (paragraph 14 of report) only comparatively unimportant rights to fell timber for agricultural implements, firewood, and other purposes existed. It was therefore recommended by the Committee that if pasture was to be permitted within the inner line, this should only be on payment.

It was further proposed that of the outer or unreserved forest area a small proportion only be closed for reproduction and improvement, and that free grazing be permitted in the open portions under such conditions as regards fires, damage, &c., as might be decided upon in each case by the Collector and District Forest Officer. The conditions under which timber for agricultural implements, firewood, &c., was to be taken or procured from the reserved area were left for future consideration.

The idea of an inner line within which the forests should be rigidly protected was, as already mentioned, first started in 1872 by Mr. Puckle while Collector of the district, and was approved by Government in their Orders of 1874. Mr. Puckle's line was only cut for a short length in the vicinity of Courtallam, but his idea has been taken up and carried out by the late Committee.

Blocks proposed by Committee, and Private Forests.

576. It will now be well to enumerate the blocks selected by the Committee, and the private lands on the hills.

Proceeding from south to north, we have in the Nángunéri taluk one inner block proposed to be formed by the Committee measuring forty-nine square miles, and in this block there are twenty-three plots of land held on patta and mostly cultivated with coffee, aggregating 733 acres on which the assessment amounts to Rs. 199. The boundaries of these plots, however, have not yet been finally settled. Outside the inner line, I am informed, that all land above the Revenue Survey line is at the disposal of Government.

In the Ambásamudram taluk the Committee have proposed a block measuring 142 square miles out of a total area of 239 square miles.

Above the outer line there are the following enclosures, which are in dispute or are private property:—

1*st*.—The Singampati Zemindari, consisting of about 82 square miles on the outer hills, which have been decided to belong to the Zemindar, and a large tract of land between this and the crest of the ghâts which is claimed by the Zemindar and which at present is under dispute.

2nd.—The Katalaimalai estate, the property of the Pápanásam pagoda, measuring 5·76 square miles, ascending from the bottom of the Kariár valley to the top of the ridge, the highest point being about 3,000 feet. It is forest and grass land, with one or two Malai Arasan villages and their gardens and some coffee plantations in bad condition.

3rd.—A number of fields cleared and under cultivation in the Sarviyár valley and on the left bank of the Támbraparni, the boundaries of which, and the rights in which, require further investigation.

4th.—A coffee estate in the valley leading to the Ayankoil pass, the boundaries of which have not yet been finally settled.

577. In the Tenkási taluk three blocks have been selected by the Committee, aggregating 28 square miles, out of a total forest area of 53 square miles. One of these blocks is situated south-west of Courtallam, while the two others are north of the Courtallam gap. Within the forests in the Tenkási taluk are included a number of holdings, chiefly cultivated with coffee and estimated to aggregate about 2,500 acres, the boundaries of which require settlement.

578. In the Sankaranainárkoil taluk, the Committee have proposed the demarcation of one block of 31 square miles out of a total ghât-forest area of 79 square miles. Within the forest area of this taluk is included a tract belonging to the Zemindar of Sivagiri, a portion of which is under dispute.

In the Srívilliputur taluk, the Committee have selected one block measuring 36 square miles out of a total forest area of 99 square miles. In the forests of this taluk is included the estate of the Sátúr Zemindar.

579. Recapitulating, the following are the areas selected by the Committee compared with the total forest area :—

Taluks.	Area of Inner Blocks.	Total Forest Area.
	SQ. MILES.	SQ. MILES.
Nángunéri	49·27	89·45
Ambásamudram	142·20	238·85
Tenkási	28·14	53·19
Sankaranainárkoil	30·84	78·83
Srivilliputur	36·36	98·87
Total ..	286·81	559·19

Action proposed under the Act.

580. It has, I understand, been decided by the Collector, in accordance with the proposals of the District Forest Committee, that no fresh pattas are to be granted in the ghât forests.

The inner line has been proposed by the Committee as the boundary of the reserved forest, but now, since the Forest Act has been passed, the proposed reserves will have to be reconsidered.

On discussing the whole question on the spot with the Collector and with the Conservator and Mr. Hayne, who constituted the Committee, I have come to the conclusion that it will be necessary, as soon as possible, to take measures for constituting the whole area above the outer line laid down by the Revenue Survey, as far as it is at the disposal of Government, a reserved forest under the Act.

This, I admit, is a bold proposal, and it may be objected that thereby we close a large area against the extension of cultivation, and prevent within it the development of private enterprise. But, as far as we know at present, it is infinitely more important for the maintenance of irrigation in the plains of the Tinnevelly District, that these forests, as far as they are at the disposal of Government, should be preserved and improved, than that cultivation on these hills should be extended. This view of the case has, as already explained, been held and acted upon by successive Collectors ever since 1837, and the District Forest Committee have virtually accepted it.

581. I have examined the boundary line of the inner blocks selected by the Committee, and have come to the conclusion that it will not be easy to maintain it as the boundary of the reserved forests, and, moreover, that it will be difficult to select any suitable inner line half-way up the hills so as to exclude the outer slopes from the reserved forets. In the present case the best plan will be to constitute as reserved forests the whole of these hills above the Revenue Survey limits, as far as they are at the disposal of Government. Zemindari and other private estates will be excluded, or will form enclosures of private property within these reserved forests. There has been some correspondence regarding the arrangements which should be made for coffee plantations and other private lands included within the area proposed to be reserved, and it has been decided that broad belts covering the right of way to such lands should be demarcated and excluded from the reserved area. This, however, is hardly necessary and would, if carried out, cut up the reserves in a most inconvenient manner. All rights of way will be settled and defined when the forest is constituted a reserve, and all that is required is to clear fire lines along recognized roads wherever they pass through any forest which it is proposed to protect against fire.

If this view of the case is accepted, then two things will have to be done under the Act: the boundaries between the private lands and the reserved forests will have to be finally settled, and arrangements will have to be made to provide for the customary requirements of the villages at the foot of the hills in the matter of pasture, wood, and other forest produce, as well as to inquire into any rights of private persons which may exist within the area, and either to compensate these holders, or to provide for the continued exercise of such rights.

As regards the requirements of the villages adjoining the forests, the chief matters for which provision must be made, are pasture, and the collection of firewood and wood for agricultural implements. In some cases there are hills and other waste lands at the disposal of Government within the Revenue Survey boundary line, and therefore outside the limits of the lands now proposed to be constituted reserved forests, from which the neighbouring villages are supplied with wood and where they graze their cattle. But, as a rule, the requirements of the villages at the foot of the ghâts must be provided for within the areas proposed to be declared reserved forests under the Act. Nor will there be any difficulty in doing this, provided the arrangement is made at the outset that free pasture and the cutting of wood is restricted to those areas which are not included within blocks set apart for protection against fire. The position and boundaries of these blocks cannot be settled beforehand; they must be selected in detail and gradually, as the work of protection against fire progresses. There will then, above the Revenue Survey limits, be only one class of interior lines, those which define the blocks from which fires are excluded and in which no pasture or cutting of wood is permitted except on payment and under the control of the Forest Officer in charge, as will be explained further on.

582. Should any delay occur in proceeding under the Forest Act, then steps must be taken under the Madras Boundaries Act (XXVIII of 1860) to effect a speedy settlement of the boundaries of all private estates adjoining the outer line or enclosed within it. For this purpose it will be necessary to depute a special Civil Officer, for it is essential that this work should be carried on without interruption, and that it should be completed speedily. I am informed that the delay in several boundary cases, which are still pending, is due to the extension of time granted by Government, under Section 25, to landholders, who had allowed the time fixed by the Act for appealing from the decision of the Settlement Officer to pass by. Such extensions must, as a matter of course, be granted on just and reasonable cause being shown; but it should also be borne in mind that, as far as our present knowledge goes, the prosperity of a large portion of the District is at stake, and that hence it is of the greatest importance to settle these boundaries speedily and finally. In some cases I understand that the assessment paid hitherto by the holders of pattas in these forests has been in excess of the area actually held by them, and that, in such cases, it has hitherto been the custom to permit the patta-holder to select the additional land required to complete the area entered in the patta wherever he may choose. Obviously such procedure is apt to cut up

the forest in a manner most inconvenient, and might render protection exceedingly difficult. It seems a matter for consideration, whether in such cases the excess area might not be selected by Government and assigned to the holder, with the alternative of accepting a refund of the excess assessment.

583. As regards the arrangements to be made for providing pasture, wood and other forest produce for the villages in the vicinity of the forests, the main point to be kept in view must be, as already explained, to reserve the power of closing and protecting against fire those portions of the forests, the protection of which is most important for the maintenance of the water-supply in the rivers. These areas and their boundaries cannot be settled at once but only gradually, and therefore the arrangements made for the settlement of these rights must be such as to leave Government free to make such arrangements as the circumstances of the case may require.

Protection of the Ghat Forests against Fire.

584. In these forests of the Tinnevelly ghâts the most destructive agents at work are the annual fires of the dry season. These fires, which are lighted in the hot weather in the grass lands surrounding the forests or scattered through them, in order to produce a fresh crop of grass, or which are kindled by the Malai Arasans when burning the jungle cut on the clearances made by them for cultivation, cause great damage. The evergreen forests are eaten into on their edges, and their area is reduced every year. The deciduous forests are kept in a stunted and open condition. These fires destroy the young growth of seedlings and coppice shoots; they damage the larger trees, and they maintain the soil in a hard and impoverished condition. On the other hand, whenever such a poor open forest has, during a series of years, been protected from fire, its condition improves rapidly. Thickets of young growth spring up between the trees and kill out the grass. A forest which is visited by the annual jungle fires has a hard surface soil, unprotected by underwood and leaves, the rain runs off and floods the streams, while a forest protected from fire acts like a sponge. For the maintenance of a dry-weather water-supply, those forests only are useful which are safe against fires, either because they are naturally evergreen, or because they have improved through continued fire protection. It is important to protect forests against indiscriminate cutting, but if the object is to make the streams flow more evenly, and to increase the dry-weather water-supply in rivers, their protection against fire is the main point to be aimed at. The forests on the Tinnevelly hills have certainly suffered more from the annual fires than from excessive felling.

585. Hence what we must aim at first of all is, to protect against the annual fires as large a portion of the Government forest area along the ghâts as possible, in order to put a stop to the diminution of the area of evergreen forests which is now steadily progressing, and in order, as much as possible, to increase the extent of compact and well-stocked forest generally. The task of protecting these ghât forests against fires is one of unusual difficulty, and, after discussing the subject with the Collector and the Conservator, I have come to the conclusion that the only plan, which under existing circumstances is likely to lead to success, will be, during the first few years at least, to relieve the District Forest Officer of all other duties and to limit his work strictly to the care and protection of these ghât forests.

586. If this suggestion is accepted, the District Forest Officer should at once be placed in charge of the entire area situated above the Revenue Survey line, and as soon as the boundaries of the enclosed private lands have been settled, he should also be placed in charge of the entire revenue administration of these lands, acting in this as in all other matters as the Assistant to the Collector.

A proposal has been made in the report by the Forest Committee that the assessment paid on these private lands should be credited to Forests. This, in my opinion, is not a matter of material importance; the essential point is, that the District Forest Officer must have complete charge of the whole area included

within the outer line. If necessary, a subordinate officer of the Revenue Department, say of the rank of a Revenue Inspector, may be placed under his orders. But within this area of 559 square miles, which I propose should be constituted reserved forest, all authority must be vested in the Forest Officer, who will exercise such authority subordinate to the Collector. If this is not done, the protection of these forests, especially the protection against fire, will be found exceedingly difficult.

Detailed Proposals.

587. If these suggestions regarding the general organization are assented to, the District Forest Officer may at once commence fire protection as far as circumstances may permit. For this purpose, I propose that Mr. Hayne should, in the first instance, take in hand the belt of forest which extends from Mahéndragiri in the Nángunéri taluk to the ghâts west of Courtallam. In this block, which comprises the whole of the areas proposed to be demarcated in the Nángunéri, Ambásamudram, and part of those in Tenkási taluks, I would propose that, as a commencement, three substantial rest-houses should be built at an elevation of not less than 3,000 feet for the accommodation of the Forest Officer and his subordinates at all seasons of the year.

One of these houses should be built in the Nángunéri taluk, the second should be built in the heart of the Ambásamudram forests, if possible in the vicinity of the Katalaimalai estate which will always be a source of difficulty; and the third may be erected on the ghâts near Courtallam. Each of these houses should be made accessible from the plains by a bridle-path, and eventually a path should be constructed to connect them and to facilitate communication between these places through the forest.

588. It may now be useful to place on record a few suggestions regarding the plan to be followed in this business, for the consideration of the Forest Officer, who will, under the orders of the Collector, be entrusted with this work. I will assume that the work will be commenced in the southern portion of the forests in the Nángunéri taluk. There are five main points to be considered in this business:—*First*, to secure the assistance of the persons whose cattle graze in the forest; *Second*, to regulate the kumri clearings of the hill tribes; *Third*, the clearing and burning of fire-lines; *Fourth*, the enclosures of private lands; and *Fifth*, the organization of an establishment of fire-watchers.

As regards pasture, matters must be so arranged at the time of forest settlement, that the free pasture of the villages at the foot of the ghâts must be confined to the areas outside the fire-protected blocks, and that, within the blocks selected for protection against fire, no grazing is permitted except on payment. I would urge further that cattle should not be admitted promiscuously on payment of a fixed rate per head to any of the blocks set apart for fire protection, but that the pasture in each block be leased to a responsible person with whom a distinct agreement should be made. In this agreement, it should be stipulated that on the occurrence of fires the block would forthwith be closed, but that if the contractor succeeded in assisting Government in fire protection, the contract would be continued to him. Government should not bind itself to maintain a certain rate of grazing dues, but should reserve full liberty, in the case of fresh contracts, to raise these grazing dues whenever such might appear necessary.

If these suggestions are carried out, the Forest Officers will secure the assistance of the grazing interest in keeping out fires. It goes without saying that these arrangements will require great tact and judgment, as well as patient perseverance in one line of policy.

589. A great difficulty in fire protection will be found to be the kumri cultivation by the hill tribes, commonly called Malai Arasans. In the forests of the Ambásamudram range, the Katalaimalai, and the Singampati Zemindari there are settlements of Malai Arasans, a few hundreds in number, who have no permanent fields, but who subsist by kumri cultivation. They generally cut the forest in February,

burn it in March, and raise a crop on the ashes, and generally a second crop in the year following. They pay no taxes or land revenue of any kind, and the damage they do to the forest is not limited to the clearing actually made by them, but consists chiefly in the spread of fire from the burnings into the adjoining forest. The following is Colonel Beddome's account of the kumri clearings recorded in his inspection report of 22nd September 1879 :—

"The virgin heavy forest is not of nearly the extent that might be supposed; it nearly all lies in the zone between 2,000 and 4,000 feet elevation, which is also the coffee zone, and its area within any possible boundaries that could be claimed by the Singampati Zemindar could scarcely aggregate more than 8,000 to 10,000 acres; so that, if coffee planters once get a footing in it, its total disappearance would soon be effected. Below the line of about 2,000 feet elevation, I found that very large tracts of the old virgin forest have already disappeared before hill cultivation (Kumari), and are now replaced by rank growth of various ages, which are refelled and burnt in rotation; it would be almost useless to attempt to reserve such tracts, and the hill cultivation may continue therein; there can be no questioning the fact that such tracts in a series of years become grass land; it is proved beyond a doubt by some old kumari tracts on the Pápanásam Hills in Government limits north of the Singampati Forests; at every succession of felling and burning, more and more of the soil disappears, and the jungle growth becomes poorer and poorer; the fine forest growth of the glorious evergreen trees disappears with the first felling and burning, these trees being replaced by charcoal trees (Sponia) *Clerodendrons, Macarangas, Mallotus distans,* thorny tree-*Solanums,* thorny *Cæsalpinias,* and many other weak, rapidly growing, worthless trees, shrubs, creepers and grass quite foreign to the evergreen forest."

Hitherto the Forest Officers have not been able to utilize the hill tribes of the ghâts for the protection of the forest and for forest work, but an attempt should be made, and if this attempt succeeds, it will be a great advantage to retain these people in the forests, as they are the only permanent inhabitants of these tracts. If the suggestions here submitted regarding the organization of the forest business in these hills are accepted, these people will look to the Forest Officer as the representative of Government, and one of his first duties will be to assign to them for their kumri clearings suitable tracts, where the least harm is done to the forest, and to prevent the fire spreading into the forest from their clearings. The clearings made by these people in the basin of the Támbraparni are of very large extent, and have doubtless contributed much towards the deterioration of the forests, but at the elevations where these clearings are ordinarily made, *i.e.*, between 500 and 3,000 feet, the reproduction of the forest is exceedingly rapid, and with careful management it ought to be possible to reduce the damage done by them to a minimum. This of course presupposes that these hill people are, as suggested above, placed under the sole control of the Forest Officer.

The main point to be borne in mind in assigning the locality for each year's clearings to these people is, that they should not be on steep slopes, but on level or gently-sloping ground, that the clearings should be in blocks of moderate extent, and should, if possible, on all sides be surrounded by thick evergreen forest. If these precautions are maintained, it does not appear to me to be of much consequence whether the clearings are made in original evergreen forests or in secondary growth. One of the three rest-houses proposed to be built for the Forest Officer should be in the midst of these settlements of Malai Arasans, and the Forest Officer should make it one of his chief duties to live among them and to exercise as much influence upon them as possible. A good plan would be to employ these people for the collection of cardamoms and gallnuts, and, if possible, also as fire-watchers and forest guards. At present, both the forest guards and the people who collect cardamoms come up from the plains.

590. As regards the selection of fire lines, the action of the Forest Officer must entirely be guided by the configuration of the ground and by other circumstances. But two leading principles should always be borne in mind, namely, that in a hilly country fire lines are useless unless a practicable path is opened out alongside and that tracts stocked with grass are always a source of danger and must be burnt early in the season unless the arrangements have sufficiently advanced to

protect these grass lands effectually against fire. As the inner line in Nángunéri has already been cut to a width of 15 feet, an endeavour should be made to utilize this line as far as practicable for fire protection. It should be kept clear, and a practicable path should be made along it; and the forest outside of it should be burnt as early in the season as possible. There may be instances in which the line runs over impracticable ground, and in such cases deviations may be necessary. Along the Travancore boundary, where this boundary follows the line of the ghâts, the forest is all evergreen and no risk from inroads of fire need be apprehended; but on the south side, between the Government forests and the Panagudi forests of Travancore, the boundary, which is here about 3 miles long, will, Mr. Hayne informs me, have to be cleared, and the grass and brushwood burnt as proposed in the case of the inner line.

To the north the fire-protected block must also be protected by fire lines wherever this may be necessary. Paths used by the people which lead through the forests are an advantage, because they make the forests accessible; but fire lines should always be cleared and maintained along such paths. Regarding the width of fire lines, no definite suggestions can be made: this must, in each district, be determined by actual experience. They must be wider where they pass through grass-land than in forest. In ordinary deciduous forest an attempt should be made to leave all large trees standing on the fire lines, and only to clear away grass and brushwood. In evergreen forest, fire lines are not, as a rule, required, but paths should be made and maintained, so as to facilitate communication between the different portions of the forest. As long ago as November 1876, Mr. A. J. Stuart, while acting as Collector, advocated that a system of bridle-paths be laid through the ghât forests. Colonel Beddome recognized the necessity of this measure, but was doubtful of proposing it then, while the revenue was so small. If it is intended to maintain these forests for the sake of the water-supply in the rivers, then a system of fire lines and bridle-paths is indispensable and the work must be undertaken, although it may entail considerable outlay not at present covered by the revenue of these forests.

The numerous enclosures of private land will, I fear, be a source of considerable difficulty, and it will probably be necessary to apply to these lands the provisions of Chapter IV of the Forest Act, so as to compel the proprietors to take effective steps to guard against the ingress of fires from their estates into Government land. Otherwise it may be impossible to protect against fire this or any of the other blocks in these ghât forests.

I have suggested that the ghât forests in the Nángunéri taluk be taken in hand first, but I do not wish it to be understood that operations should necessarily extend over the entire Nángunéri forests at once.

The best plan will be to take in hand one portion only, and after fire protection has been successfully established in this portion, to extend the work to the adjoining block. Hence it will be well for the Forest Officer at once to lay down on the map the boundaries of the blocks into which the Nángunéri forest may most conveniently be divided. The lines which separate the blocks should, as far as practicable, run along existing paths or should be so selected that paths along them may, without difficulty, be constructed. By the time that fire protection on the ghâts of the Nángunéri taluk has been fairly established, it is hoped that the boundaries of the Singampati Zemindari and of all the other private estates enclosed in the forests as far as Courtallam will have been finally settled, and when this has been accomplished, the work may be extended to the Ambásamudram and Courtallam forests; so that eventually the whole range of forest from Mahéndragiri to Courtallam may be placed under special protection as far as it is intended to protect it from fire. When this has been accomplished, the northern half of the ghât forests, which extend from Tenkási to the Madura frontier, may then be taken in hand.

591. It will here be proper to speak of the organization of the executive and protective establishments and of a staff of fire-watchers. Eventually, after the protection of the ghât forests along the whole line has been placed upon a satisfactory footing, and when the arrangements for working them and for drawing revenue from pasture have been perfected, it will be possible to appoint a Forest Ranger or Forester in each of the five taluks which adjoin the ghâts. But at the outset and

until fire protection of selected blocks has been extended over the whole of the hills, a different organization will be necessary as a temporary measure. During this period I consider it best that the Forest Officer should deal directly with the forest guards in charge of the several beats in the ghât forests. These beats, Mr. Hayne thinks, should be arranged as follows for the southern half of the forests: two in the Nángunéri range, three in the Ambásamudram, and one in the forests near Courtallam; total six beats, each in charge of a forest guard.

As already explained the Forest Officer will, as a temporary measure, deal with the forest guards direct, and without the intervention of any Rangers or Foresters, but he will require a staff of Foresters to supervise the cutting and maintenance of fire lines and to organize and supervise the staff of fire-watchers. Fire-watchers will only be entertained during the dry season, and the arrangement should be this—to make each man responsible for a certain block of the forest as well as for a certain length of fire-lines or for certain paths leading through the forest. As far as practicable these fire-watchers should be selected from among the hill people residing in the forest, and the arrangement with them should be so made, that part at least of their remuneration should depend upon their success in protecting the beats assigned to them.

Experience must show what strength this establishment should have, and I do not therefore submit any estimates on this subject at present.

Revenue from Ghat Forests.

592. The revenue hitherto realized from the ghât forests has consisted of the following items:—

First, timber, firewood, and bamboos brought to depôt, gross revenue Rs. 10,000, charges Rs. 6,500, net revenue Rs. 3,500. The depôts have hitherto been Kalakád (lately transferred as an experiment to Palamcottah), Ambásamudram and Sankaranainárkoil. The timber brought to these depôts has chiefly consisted of kong, teak, vengay, maile (*Vitex altissima*), and junglewood, and it is brought down by contractors, who are paid certain rates per cubic foot.

The quantity of timber exported under these arrangements from the forests in question, is so small that there is no risk of deterioration of the forests by means of these operations, and they may therefore be continued on the present scale. Considerable quantities of wood are imported into the Tinnevelly District from Travancore *viâ* Courtallam, and by sea to Tuticorin from Ceylon, Travancore and Malabar, and it is not likely that the demand for indigenous wood will increase considerably.*

The cuttings of teak should be made with great caution, the object being kept in view to improve the condition of some of the more important teak-producing tracts in these forests. As already stated, teak is chiefly found in some of the outer valleys, and there it does not attain any large size. The climate is probably too dry for this tree to grow as freely as it does on the west side of the ghâts in Travancore, and the opinion of the local officers is not favorable as to the future growth of teak

* The following have been the mean imports of Timber and Firewood to Tuticorin during the five years ending with 1881-82:—

Whence imported.	Quantity.	Value.	Remarks.
	TONS.	RS.	
Ceylon	419	4,322	Pali, Palmyras, and wood for catamarans.
Travancore	433	11,773	Venteak, (*Lagerstromia lanceolata*) and mango, for house and ship-building.
Malabar	13	399	
Other ports	65	577	
Total ..	930	17,071	

in these forests. Nevertheless I found, in examining the teak localities in the Sérviyár valley and on the low hills between that river and the Kariár, a large number of straight and well-shaped poles up to forty feet high, which had grown up in spite of fires, of creepers and former promiscuous cutting, and it must be remembered that in these same localities the best and largest poles had lately been cut out for sale at depôts. If these tracts which are now burnt annually were protected against fire, the forests would grow thicker and the soil would improve, and it might then confidently be hoped that the stature and growth of the teak also would improve. The teak localities in these forests are all easily accessible from the plains, and I would strongly recommend that the most promising tracts be at once selected and their protection from fire be commenced as soon as possible as a special case and apart from the blocks to be protected on the higher hills. I would thus recommend that the teak-producing tract on the left bank of the Támbraparni below the Kariár river, and on both sides of the Sérviyár be taken in hand at once, and that other tracts similarly situated be selected.

Near Kalakád there is a teak forest at the foot of the hills, which Colonel Beddome, in a report of the 18th August 1867, describes as follows:—

"There is a very large block of teak at the base of the mountains near this (Kalakád), and it extends a mile or two up the hill slopes. There must be several thousand acres, and as it grows almost to the exclusion of every other kind of tree, it has more the appearance of a plantation than a natural forest; it has been all cut over periodically, until the last two or three years when all felling was stopped, and almost all the young trees are from coppice stools. When the stool is young there is often a fine straight healthy coppice, but from older stools the growth is not so good and much pruning is necessary, particularly where there are several coppice shoots from one stool. The whole of this should, I think, be strictly preserved, and it will become a valuable tract if properly pruned and cared for."

So far Colonel Beddome. I may add that I would not advocate pruning in such places. If fires are kept out, saplings and poles of other trees will grow up among the teak, and the stems will then gradually become clean and straight. Though in some instances fire protection of the teak localities would precede the measures for the protection of the ghât forests, they would nevertheless eventually form an integral portion of the general system of fire conservancy along the line of ghâts. Within the fire-protected area I would recommend that no teak be cut for the present, in order to increase the proportion of this species, but large trees of other kinds might be cut as much as there is a demand for them. As a general rule, however, I would advocate that the timber operations should be confined chiefly to the outer forests which it is intended to leave open for grazing and where fire protection cannot be attempted.

593. The second source of revenue from the ghât forests is the seigniorage paid for firewood and charcoal removed from the forests, and the revenue on this account is estimated at Rs. 7,000. The rates of seigniorage are as follows:—

—	Head-load.	Cart-load.
	Rs. A. P.	Rs. A. P.
Jungle-wood	0 2 0	2 0 0
Firewood	0 0 5	0 6 0
Charcoal	0 1 6	1 8 0

This system may continue for the present, on the understanding that, until fire protection has been firmly established in any forest range, the export of these articles be confined to the area outside the fire-protected blocks. Eventually, after fire protection has become an accomplished fact in any forest range, special arrangements for the extraction of timber, firewood and charcoal from that area may be made.

Revenue is also derived from the ghât forests by the sale of cardamoms, gallnuts, honey and other forest produce. These articles are brought to depôts and paid for at certain rates and they are sold by tender. As far as I could ascertain, the cardamoms in these ghât forests are collected where they grow naturally in the forest without any attempt at increasing their supply, and it is for consider-

ation whether the well-known plan by which the cardamom forests of Coorg are worked, might not here be followed. This plan consists in felling a large tree in the midst of the forest, after which, under the influence of the light given, the plants spring up in large numbers from the seed buried in the ground or from rhizomes. These natural cardamom gardens are carefully weeded, but this and the felling of the trees are the only cultural operations required. In this manner it would probably be possible considerably to increase the quantity of cardamoms collected in these forests where the plant is exceedingly common. I noticed two varieties, that with creeping flower stems, and that which has the flower stems erect and the leaf-bearing stems much larger. The seeds of both kinds are collected and sold, and I was informed that no distinction is made in the market.

594. As explained, the sale of timber extracted and sold on Government account has hitherto yielded Rs. 10,000; seigniorage for building wood, firewood, bamboos, charcoal and minor produce Rs. 7,000, while the sale of cardamom, &c., has yielded Rs. 5,000. In addition to this there will be grazing dues in the fire-protected blocks. An effort must be made, by careful management under an officer who will devote his time entirely to the ghât forests, to increase the revenue, and I will assume that the gross revenue of the ghât forests will be brought up to Rs. 32,000.

Charges.

595. I am not in a position to estimate the outlay which the protection of these Government forests will entail, but it is probable that the following annual outlay will be found to be sufficient during the first five years :—

	Rs.
1. Fire protection, clearing of fire lines, and pay of fire-watchers...	10,000
2. Rest-houses and communications	6,000
3. Establishment, including pay and travelling allowance of an officer of the controlling staff	16,000
Total ...	32,000

Adding to this charges on account of revenue, Rs. 8,000, it may be hoped that, under good management, the excess outlay on account of these ghât forests will not be more than Rs. 8,000 a year. Should further experience show that the protection of the Government forests requires any interference with private forests, such interference will entail additional outlay which may be considerable, but regarding the amount of which no idea whatsoever can be formed. The excess expenditure on account of these ghât forests must be regarded as the price paid by Government for maintaining the water-supply required for irrigation in the Tinnevelly District.

Forest in the Plain Country.

596. I said at the outset that the forest administration in the Tinnevelly District had other aims, besides the care of the ghât forests, viz., the improvement of the waste land, which can be set apart for forest growth. The total area of the Government waste and forest in this district is 929,000 acres, of which about 358,000 are in the hills and 571,000 are in the plains. The necessity for taking care of this area and converting a portion of it into forest requires no proof. One Forest Officer is required for the ghâts and a second officer is wanted for the plains. Or it may hereafter be found more convenient to assign to one officer the northern and to the other the southern taluks, in which case each will have forests in the hills as well as in the plains.

It seems probable that the South Indian Railway will in future require large quantities of wood for locomotive fuel, but as it is intended to build a branch line from Tinnevelly to Travancore, it may be assumed that some of the forests in Travancore or on the Tinnevelly ghâts, will be tapped by this line, and the question whether part of the fuel required can be yielded by the woodlands in the plains need not at present be further discussed.

Hence, in considering the management of the waste lands and forest in the plain portion of the district, the prospect of having to supply railway fuel need not

specially be taken into account, although if the operations for the increased production of wood in that part of the district result in a larger supply than can be consumed locally it will be very convenient to have the railway as an additional customer.

597. Forestry in the plains of Tinnevelly is a difficult task on account of the hot and exceedingly dry climate. At present the greater part of the district is bare and naked. There seems however no doubt that at one time, and probably not more than eighty years ago, a large part of the high ground between the rivers in the Tinnevelly District was covered with jungle. At the present time however the waste land in the plains has become denuded and most of the low hills which are scattered all over the district are dry and bare as if they had been shaven, the exceptions being few and hence well marked. It is a relief, in coming by train from Madura to Tinnevelly, to see east of the Kumárapuram station the range of hills in the Ettiyápuram Zemindari which have been carefully protected for some time, and which in consequence of this protection are now fairly covered with scrub.

598. The Collector has placed three tracts on low hills under special protection: these are Taliyuttu near Tinnevelly, Kolundamámalai near Shermádevi, and the Rajupaliem hill in the Srívilliputur taluk. They are all fenced in and some progress in the growth of scrub is said to be visible in all of them. These operations are under Jungle Conservancy. I examined the hill near Shermádevi. The area protected here measures 1,200 acres, and the goats and cattle have not been completely excluded. There is a fair crop of grass on the ground, and coppice shoots make their appearance in many places above the grass. This, like most hills in the plains of the Tinnevelly District, is covered with huge boulders of gneiss, and all along its foot are numerous springs, many of which feed tanks or are otherwise valuable.

There is no doubt that if these hills could be protected completely and thereby clothed with trees and shrubs, the result would be an increased water-supply in the springs, in addition to the fodder and fuel which the protected areas would furnish to the surrounding villages.

Sand Teris, and Coast Jungles.

599. In the Tenkarai taluk there are extensive dunes of shifting red sand, which is kept in constant motion by the wind, and is often blown many miles out to sea. These tracts are locally called téris. One, the Kuduraimalai téri, west of Tiruchendúr, is estimated to cover 12,000 acres, and another at Nadavakurichi, in the south part of the taluk, is estimated to cover 4,000 acres. On the west side of the Kuduraimalai téri extensive plantations of palmyras have been made. Mr. Pennington, the Collector, informs me that the steady reclamation of these téri tracts is progressing, and that an experiment to fix the sand by planting cuttings of *Ipomœa pes caprœ* has been commenced. These are very important works, they should be steadily continued, and it is most desirable that they should be supervised by a professionally-trained Forest Officer. *Spinifex squarrosus*, Linn., a large creeping grass, which is common all along the coast, should have a trial on these sand hills. In regard to these dunes the point to make for will be to cultivate those species of indigenous herbs and grasses which can most easily be propagated, and after the surface sand has in some measure been fixed, to plant such trees as can be made to grow there.

600. The jungles of the Ettiyápuram Zemindari on the coast which commence five miles north of Tuticorin are all on loose sand: they consist chiefly of *Acacia planifrons*, which here grows remarkably well, though it is at best a very slow grower. I saw numerous self-sown seedlings and coppice shoots, which however in these jungles have no chance on account of the unrestricted grazing. The umbrella thorn is associated with *Acacia Latronum*, *Gmelina arborea* and *Fluggea Leucopyrus*. These jungles supply Tuticorin with fuel. At the time of my visit there were large depôts on the coast, and numerous settlements of wood-cutters with carts were at work in these jungles. Reproduction there was none, and in this exceedingly dry and hot climate the result of such heavy cuttings, if continued, must

unavoidably be the denudation of this tract, and the first result of this denudation will be that the sand on the surface will become shifting and this will make the station of Tuticorin exceedingly unpleasant. If the present reckless cutting continues, a large extent of naked téris will be formed, useless to the proprietor and a source of trouble to his tenants in the vicinity. These jungles are in the same Zemindari as the protected hills near the railway mentioned above.

601. South of the station of Tuticorin, a tract of land has been nominally reserved for a considerable time. This tract I examined on the 18th February. It is situated on both sides of the Tuticorin and Palamcottah high road within the limits of Milavittan village. The reserve extends from the Tuticorin drainage channel on the north-west to the occupied lands of Levingepuram and Shevandakulam (two hamlets of Milavittan) on the south-east side. The Deputy Tahsildar informs me that in 1873 about 150 survey numbers of the village area, aggregating 750 acres, were taken up and, on compensation being paid to the patta-holders, were handed over to the Salt Department. The western portion of this area was subsequently relinquished by the Salt Department and was constituted a fuel reserve under the Jungle Conservancy Fund. But there is, I am informed, no record of the boundaries in the village accounts, nor have any entries relating to this reserve been made in the village maps or in the Survey and Settlement register of the village.

The boundaries of the reserve have not in any way been demarcated on the ground. A portion of the area of this reserve, about 100 acres, was in 1880 applied for on darkhast by a resident of Tuticorin, and I am informed that he has been placed in possession, though the patta has not yet been granted. There was correspondence on the subject, the grant of the patta having been objected to by the Forest Officer.

Clearly it is necessary in future, whenever any area is constituted a forest reserve, that an entry should be made in the village register indicating the numbers included within the reserve, and it is also desirable that on the village map the areas included in such a reserve should be indicated by a green wash or otherwise.

The numbers included in the reserve are entered in the village register as salt swamp; but this is not correct, they are dry sandy tracts imperfectly stocked with a low, open jungle of *Acacia Latronum*, *Acacia planifrons*, *Lawsonia alba*, *Fluggea Leucopyrus*, *Zizyphus nummularia*, with a small *Indigofera*, and a species of *Cassia* which yields medicinal senna. There had been a good deal of cutting, and the place is overrun with cattle. Under efficient protection there is no reason why this jungle should not be thick and compact like that under the Salt Department which adjoins it, and if the land has not yet been alienated it is most desirable in the interest of the station of Tuticorin that it should be constituted a reserved forest under the Act, and be placed under efficient protection. Adjoining the Salt Department reserve there is a plantation which affords a good instance of the growth of Casuarina in this climate. The trees are sixteen years old, from fifty to sixty feet high, and the mean girth (breast high) of twenty trees was seventeen inches, the minimum being eleven and the maximum twenty-five inches. This is slow growth for Casuarina, the plants had been watered while young, water is not far from the surface—and the soil is apparently similar to that in which Casuarina thrives so well on the coast in the Nellore, Chingleput and South Arcot Districts. I have heard the slow growth of Casuarina at Tuticorin ascribed to unsuitable subsoil and not to the dry climate. If my suggestions are carried out, and if a reserve is formed under the Act, experimental plantations of this tree should continue to be made, though it cannot be expected that they will yield the same quantity of wood per acre as the plantations made in the moister climate of the northern districts.

If the reserve is formed and is really placed under protection, I would also advocate that natural reproduction be aided by sowings of the two *Acacias* and of *Lawsonia*. The Portia tree (*Thespesia populnea*) might also be planted. It thrives well on the coast and there are small forests of it on the islands opposite Tuticorin. But no success can be expected unless this reserve is fenced like the tracts in charge of the Salt Department, which, as far as I saw them north and south of Tuticorin, are efficiently protected. These salt jungles have been formed chiefly in order to shelter the salt pans against sand and dust.

Trees in Tank-beds.

602. An important source of fuel in the plains of the Tinnevelly District are the beds and the waterspread of tanks. These lands have always been more or less stocked with *Acacia arabica* and *Acacia planifrons*, and much has been done by the Forest Officers to improve the growth of trees on them, chiefly by broadcast sowings. The difficulty in these undertakings has been that it has never been possible to exclude cattle from these tank-beds. It has been stated that these tank-beds are the ordinary grazing grounds of the villages, and that cattle can therefore not be excluded from them under any circumstances. But compared with the vast extent of other grazing grounds the area of these tank-beds is insignificant, and it may perhaps be possible to close at least a portion of them against cattle. If this were done, there is no doubt that by natural growth and by means of sowings these areas would soon be completely stocked with a dense growth of babul, and as soon as this has once been accomplished, and the young trees have become large enough to be safe, cattle might be admitted for a time and some of the larger trees might be cut and sold. After this, when the ground is again cleared so as to secure reproduction cattle must again be excluded. Goats, however, should always be kept out. The management of these tank-bed reserves was fully discussed by Colonel Beddome in his inspection report of November 1876 (G.O., dated the 21st February 1877). According to that report they were taken up for forest conservancy since 1871, but their management has, Colonel Beddome states, shifted from the Forest Department to that of Jungle Conservancy, protection has never been complete and cattle have been allowed to graze indiscriminately. In 1876 their area was estimated roughly at 5,536 acres. The receipts and charges on account of this area from the commencement in 1871 until September 1881 are recorded as follows :—

Period.	Receipts.	Charges.		
		Works.	Establishment.	Total.
	Rs.	Rs.	Rs.	Rs.
From commencement to July 1879 ..	11,545	11,539	5,625	17,028
From August 1879 to September 1881 ..	3,989	363	3,984	4,347

and the quantity of fuel yielded by them until September 1879 was 2,065 tons. They were all in the vicinity of the line, and the object was to supply the South Indian Railway with fuel.

Colonel Beddome very properly proposed that the scheme should be extended and should include all the tank-beds within ten miles of the rail, and he urged that, if efficiently protected, the growth of a large amount of wood in these tank-beds would be an easy and inexpensive affair, and that this wood could, even if the Railway should not require it, always be disposed of locally at remunerative rates.

603. There is thus ample and important work of a professional nature for the Forest Officer in charge of the waste lands in the plains.

The difficulty is the smallness of the revenue derived from these lands. The only revenue has been that credited to Jungle Conservancy and the amount realized by the sale of wood produced in tank-beds, the two together amounting to about Rs. 10,000 a year, and it is not likely that this revenue can be considerably increased for the present.

Financial Prospects.

604. Having considered the work which has to be accomplished in the Tinnevelly District, it will now be necessary to discuss the financial prospects.

The following is an abstract of receipts and charges on account of Forests and Jungle Conservancy during the five years ending with 1880-81 :—

Forests.

Years.	Receipts.	Charges.			Surplus.	Deficit.
		A. Conservancy and Works.	B. Establishment and Contingencies.	Total.		
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1876-77	22,469	9,077	12,832	21,909	560	..
1877-78	23,733	8,844	13,355	22,199	1,534	..
1878-79	25,751	13,390	13,307	26,697	..	946
1879-80	21,834	12,391	18,632	31,023	..	9,189
1880-81	27,115	10,924	13,236	24,160	2,955	..
Total ..	1,20,902	54,626	71,362	1,25,988	5,049	10,135

Jungle Conservancy.

Years.	Receipts.	Charges inclusive of Establishments.	Surplus.	Deficit.
	Rs.	Rs.	Rs.	Rs.
1876-77	8,875	6,080	2,795	..
1877-78	9,048	8,663	385	..
1878-79	9,558	7,682	1,875	..
1879-80	6,151	10,631	..	4,480
1880-81	5,243	8,476	..	3,233
Total ..	38,875	41,532	5,056	7,713

605. The average figures, compared with the actuals for 1881-82 and the estimates for 1882-83, stand as follows :—

Period.	Forests.		Jungle Conservancy.	
	Receipts.	Charges.	Receipts.	Charges.
	Rs.	Rs.	Rs.	Rs.
Mean of five years, 1876-77 to 1880-81 ..	24,180	25,197	7,775	8,306
1881-82	24,132	27,086	9,186	9,271
1882-83	32,350	43,013	6,300	7,100

In all cases therefore there is an excess of charges over receipts, and at first sight there is no prospect of an equilibrium being obtained under the existing organization, much less of funds being available for a second District Forest Officer and for the extended operations proposed on the ghâts and in the plains. The financial results of forest administration in this district have not however always been as unfavorable as they have been of late years. In paragraph 37 of his report of November 1876, Colonel Beddome states the receipts and charges of the ten years ending with 1875-76 as follows :—

Period.	Receipts.	Charges.		
		A. Conservancy and Works.	B. Establishment and Contingencies.	Total.
	Rs.	Rs.	Rs.	Rs.
1866-67 to 1875-76	1,54,943	39,868	79,874	1,19,742
Annual mean	15,494	3,987	7,987	11,974

There has been an increase in the receipts, but a much larger increase in the expenditure.

606. The financial results of forest management in the ghât forests have above been estimated as follows:—

	RS.
Receipts	32,000
Charges	40,000

while for the plains forests, including the lands hitherto under Jungle Conservancy, the following figures may be put forward:—

	RS.
Receipts	10,000
Charges	12,000

This provides for a second District Forest Officer, who would probably be an Assistant Conservator.

Accepting these figures, the net financial result of forest administration in the Tinnevelly District will be a deficit of Rs. 10,000 a year.

It has already been stated, that as operations expand, a much larger outlay may become necessary. In 1879, Mr. Puckle, the then Collector, wrote when submitting an inspection report by Colonel Beddome, the Conservator, which will be found embodied in G.O., No. 2129, dated the 31st October 1879:—

"The Forest Department in this district should not be judged entirely or chiefly by financial results. The great work of the department is to preserve the sources of streams on which the prosperity of the district depends; and if they succeed in doing that, Government should, I think, be satisfied."

CHAPTER XII.

COIMBATORE.

607. I entered the Coimbatore District, coming from Palni in Madura, on the 26th February, examined the fuel reserves in the Udamalpet and Polláchi taluks, visited the Ponáchi reserve in the Anaimalai hills and reached Coimbatore on the 6th March. From the 7th to the 9th, I made an excursion to the head of the Bolampatti and Atapádi valleys, and left the district, *en route* to the Nílgiris, on the 10th March. The Conservator accompanied me from Palni to Polláchi, and Mr. Peet, the District Forest Officer, was with me throughout the district.

608. The area of the district and its classification appears from the following figures:—

	ACRES.
Zemindari and Inam land	351,738
Government land, occupied	2,294,290
Do. do. unoccupied	2,348,532
Total area of district ...	4,994,560

Of the land at the disposal of Government (unoccupied Government land) 599,200 acres are in the higher hills, not included in the survey, while 1,749,332 acres are in the plains and lower hills.

I have seen too little of the forests of the district to justify my submitting comprehensive proposals regarding the management of this vast area of land at the disposal of Government, and I shall limit my remarks to a few points, which attracted my attention during my tour.

609. The present remarks will chiefly relate to the measures which have been taken and are proposed to be taken, in order to utilize the waste land in the plains, and to the steps which appear necessary to secure the protection and good management of those forests in the hills, upon the maintenance of which the irrigation of the district to a great extent depends.

Waste lands in the Plains.

610. Broadly speaking it may be said that the Kollegál taluk, as well as the northern portion of Bhaváni and Satyamangalam, the western portion of Coimbatore and the southern part of Polláchi and Udamalpet taluks are hilly, while the rest of the country is an open plain, undulating in parts, and with isolated hills of no great elevation scattered here and there. The height of this plain above sea level is 400 feet at the junction of the Cauvery and Amrávati rivers, and about 1,200 feet near the edge of the ghâts in the Polláchi taluk.

The central and southern plain taluks are exceedingly dry, and the mean annual rainfall is at

Coimbatore	... 21 inches.
Udamalpet	... 20 „
Palladam	... 17 „
Dhárápuram	... 18 „

Near the ghâts (Polláchi 28), on the Cauvery (Bhaváni 27, Erode 24, Karúr 26), and in the northern hills (Kollegál 36) the climate is more moist. The northern and eastern part of the district is more subject to the north-east monsoon, while the southern and south-western portions receive most rain during the south-west monsoon.

Mr. Stuart's proposals.

611. In the dry taluks, a large portion of the occupied land was thrown up during the late famine. In a report dated the 9th January 1882, Mr. A. J. Stuart, the late Acting Collector, stated that 90,000 acres, assessed at Rs. 77,000, had thus been relinquished, or bought in by Government at sales for arrears, owing to death and impoverishment of ryots. The greater portion of the land thus thrown up was situated on the stretches of high ground between the Bhávani and Nóyil, and between the Nóyil and Amrávati rivers.

In this report, Mr. Stuart submitted that advantage should be taken of the opportunity to raise and settle the question how much land ought to be set apart in each village for forest and jungle reserves. He urged that the matter was the most important and pressing of all the questions that he could hear of in the district. The disforesting of the plains, Mr. Stuart considered, had much to do with deficient and ill distributed rainfall, and was one of the most potent factors in producing famine.

Accordingly Mr. Stuart asked permission to set apart a portion of the assessed waste lands in each village, not less than 10, and not more than 20 per cent. on the total area cultivated, to be entered in the village accounts as State reserves, to be fenced and planted up as funds became available, and not to be given up for cultivation.

He urged that if this opportunity were missed of obtaining land, suitable for this purpose, it would in a few years' time be necessary to pay ryots compensation to secure what will some day be wanted for planting, or fuel or jungle reserve purposes.

And, lastly, he represented that the cheap supply of fuel which would result from carrying out the scheme submitted by him would be of incalculable importance, in securing for the land the cattle manure now frequently used for fuel.

612. The Board of Revenue in submitting these proposals to Government in their Proceedings, dated the 11th February 1882, recommended that the Collector be authorized to set apart 10 per cent. of the area capable of cultivation in each village for forming fuel plantations, the selection being made from land that had been more than 18 months unoccupied, so as to avoid the danger of taking up for fuel (reserves) lands that ought more properly to be allowed, in process of time, to come under the plough, and bear food or fodder. The Board added that there would thus be some assurance that, in tracts so well populated and cultivated as the major part of Coimbatore, only the poorest lands, the lands cultivable only in the most favorable seasons were being reserved for a purpose, calculated to add to the fertility, and promote the permanent occupancy of the better lands.

Under these restrictions the Board desired to see the principle extended to all districts.

613. Government having requested me to state my opinion on the subject, I submitted, in a note of the 29th April, that the selection should not be confined to the assessed waste, and that no limit whatsoever, either as to area or quality of the land, should be imposed. Regarding the treatment of these plots, I suggested, that operations should be commenced, not simultaneously on a great many plots, but on a few selected areas, under as favorable circumstances as possible. At the same time I represented that, as a preliminary measure, steps should be taken to prevent the alienation of land which might hereafter be required for forest reserves, and which was at present waste and unoccupied.

In the orders passed on my proposals by the Board of Revenue, dated the 20th June, some of the suggestions submitted were accepted, but the limit of 10 per cent., was maintained. The Collector was directed to select from the assessed waste that had been more than 18 months unoccupied, an area approximating in each village to 10 per cent., of the total cultivated and uncultivated assessed lands thereof, as much unassessed waste being added as might be desirable. It was said that these selected lands should be set aside, not alienated, and should be entered in a separate account; they should not be let out for cultivation except temporarily.

Other Collectors were directed to follow the same course, and to submit proposals for establishments for sanction.

Subsequently, on a reference from the Collector of Coimbatore, the Conservator was, in the orders of the Board of Revenue, dated the 29th September, requested to draw up a scheme to meet the present requirements of the Coimbatore district.

614. There is no doubt that the fertility of large portions of the district, particularly in the taluks of Palladam, Dhárápuram, Erode, Karúr, Coimbatore, Polláchi and Udamalpet, would be greatly increased, if a portion of the unoccupied land could be converted into forest. Not only would the supply of leaves for manure, of firewood, and wood for building and domestic purposes be increased, but the fields in the immediate vicinity of these wood-lands would receive shelter and more moisture, and the supply of cattle-fodder during seasons of drought would be increased. Attempts have for some time past been made in several taluks of this district to select and protect tracts as village fuel reserves. On my tour I visited those in the Udamalpet and Polláchi taluks, and the following is the result of my observations.

Fuel Reserves, Udamalpet.

615. In the Udamalpet taluk the Tahsildar has, under the Collector's orders, selected a number of village fuel reserves, the formation of which he has proposed, and has actually commenced operations in seven of these plots. On the 28th February I examined several of these reserves, and learnt from the Tahsildar the arrangements made by him for this business generally. The first reserve visited was near the village of Pukkalam, four miles north of Udamalpet. This reserve occupies a portion of the bed of a tank, and measures 13 acres. The remainder of this tank bed, measuring 10 acres, is held on patta by one Seshayengar who applied for it for mulberry cultivation and who pays an assessment of Rs. 15. This portion is apparently used for grazing only, and the protection of the reserved portion will be extremely difficult, unless it should be possible to acquire possession of the whole area. The reserved portion is bounded on two sides by the tank bund and on the other two sides a ditch and hedge are supposed to have been made, of which a few traces are visible. On the ground stand a number of scattered babul (karu-vélam) trees, and a few bushes of the same species which have evidently quite lately been browsed by goats. There is a little short grass on the ground, which has been grazed over by cattle; and the Tahsildar and village officers admit that the area has not in reality been protected. A guard on Rs. 3 a month was

entertained for its protection, but has been discharged. Pits have been dug and sown with babul, but there are no plants in existence. The reserve was constituted in May 1881, and the total outlay up to date for fencing, sowing and watching has amounted to Rs. 91, of which Rs. 66 were for fencing. The Tahsildar, however, informs me that this last item has not yet been passed by him.

616. From this place I went eastwards into the lands of Ponnéri village and came across a piece of waste land measuring 13 acres held under patta for grazing purposes fairly well stocked with babul trees. It is quite a common practice in this taluk for waste lands to be held under patta for grazing purposes, and the only difference between these waste lands and the Pukkalam reserve is that, on the latter, Government has expended and is expending money to no useful purpose.

617. The second reserve visited by me is a plot of 9 acres in Kanakkampolliam, near the Komarlingam road. This piece was also constituted a reserve in May 1881. It is enclosed on two sides by the *Euphorbia* hedges of the adjoining fields, while on the two other sides a fence of dry thorns has been put up. The ground is high, with sheet rock of gneiss close under the surface, and the soil is sandy and very dry. There are a few tamarind trees and vel-vélam on the ground, as well as bushes of *Canthium parviflorum* (kara sedi) and *Albizzia amara* (vunjil). The ground is fairly stocked with grass about 12 inches high, and has evidently been protected against cattle. Here also babul has been sown in pits, and in many places the seed had germinated; but the seedlings, although they had come up well, had in most cases dried up.

In such a locality, I submit that sowing cannot lead to any useful result, unless some shelter to the young plants is provided for, and this may be done either by protecting the area for a few years, sufficiently long to enable shrubs to spring up, which may afford shelter to the seedlings, or by sowing the seed together with millet or other crops. The Tahsildar suggests that kind, which locally is known as sami.

In any case I suggest that the seed be sown in lines 15 or 20 feet apart, and thick within the lines. While, in the black soil of tank beds, babul is the best tree that could be selected, it should not be chosen for high ground like that here described, but instead vel-vélam (*Acacia leucophlœa*), vunjil (*Albizzia amara*) and tamarind.

The outlay incurred on this reserve has amounted to Rs. 92, of which Rs. 43 is on account of fencing. A guard on Rs. 3 a month was entertained for a few months at first, but is not entertained at present.

618. From this place I proceeded south to the village of Kanamanaikkenúr, and visited two plots; one a tank-bed with thick growth of babul and vel-vélam, proposed to be reserved, and the other a plot (area 10 acres) planted with palmyra trees, and at present said to be occupied by a ryot for a period of 15 years, on condition that he takes care of the trees. This plot also it is proposed to include within the reserves after the expiration of this period.

619. On the 1st March we visited the proposed reserve of Rajalabavi, an old tank-bed of 9 acres, near the high road, as well as an area close to it in Pulanginar village, of 4 acres, a portion of a tank-bed with some babul bushes, which had evidently been constantly browsed on by goats.

The outlay on this reserve had been Rs. 49, of which Rs. 32 were on account of fencing. Sowings had been made, which had however failed.

620. The total expenditure incurred on the seven plots already taken up, has amounted to Rs. 452 up to date; the total area of these plots being 43 acres. The largest of these plots is 13, and the smallest 3 acres.

At the outset a guard on Rs. 3 a month was entertained for each plot, but the Tahsildar is of opinion that this is necessary only during the first few months and that afterwards the care of these reserves may be left to Monegars of villages.

621. The fuel reserves proposed and already formed are situated in 23 villages, and the area aggregates 2,205 acres. The majority are small detached blocks of a few acres each, but in a few villages larger areas have been selected. One of these is Navanari on the borders of the Dhárápuram taluk, a village with very poor soil,

a large portion of which was deserted during the famine. Here an area aggregating 453 acres, but cut up into small plots and interlaced with occupied numbers has been proposed. It may perhaps be possible by means of exchanges gradually to consolidate this area, which can then doubtless be made into a very useful reserve.

Another is Dhalli village, where 484 acres have been proposed, forming a large but very irregularly shaped block with one outlying piece. Here also something will have to be done in order to secure a more compact shape with convenient boundaries.

A third is Andi Goundanúr situated like Dhalli at the foot of the hills on the southern edge of the taluk where an aggregate area of 560 acres has been proposed, namely, one large block with an outlying piece of 34 acres.

Fuel Reserves, Pollachi.

622. In the Polláchi taluk four reserves aggregating 21 acres have been sanctioned, and in 82 villages it has been proposed to take up pieces of land for this purpose, the area of which aggregates 1,424 acres. Of these, three only are of considerable size, namely, Peria Pothu at the south-western limit of the taluk, 400 acres; and two of 70 and 100 acres respectively situated in the north-west corner of the taluk on the borders of Cochin. The rest of the areas are between 2 and 40 acres. On the four sanctioned reserves a total sum of Rs. 60 has been expended. We visited the reserve near Kinatukadavu (8 acres). It is the bed of a shallow tank stocked with short thick grass and a few small bushes of babul. The fence is imperfect, and there were marks of cattle grazing. An area of 8 acres adjoining it is proposed to be added, and if this is done and the land effectively protected, the growth of babul at this place will probably be satisfactory, the soil being good. I may mention that, below the bund of this tank, there is a fine cocoanut garden watered from wells. In the same village a narrow piece of waste land lying between the high road and a large rock on which stands an old temple and measuring 4 acres is proposed to be reserved; but this seems to be a hopeless undertaking.

623. We also examined the reserve of Sankararayapuram which is situated 4 miles west of the high road. This reserve is well stocked with teak. But though it has been reserved from alienation, and though the teak in it has not been cut, cattle have never been excluded, and the trees of other kinds have been cut indiscriminately. If this area were really protected, the ground, which is now imperfectly stocked, would get covered with shrubs and trees of other kinds, and the soil would be loose and more moist than at present.

A satisfactory feature is that a portion of the area, near a small stream, is stocked with bamboo. The soil is a light sandy loam, and unfortunately the gneiss rock is in places close to the surface, yet real protection would do a great deal towards the improvement of the forest.

624. The country near this reserve was under forest less than 50 years ago. In the hedgerows, and scattered on the fields, as well as on the banks of streams, are numerous trees, the remains of the old forest. In the fields are large patches with coppice shoots of *Diospyros*, *Careya* and other kinds.

The principal trees found in this part of the country are the following :—

Casearia tomentosa, *Butea frondosa*, *Premna tomentosa*, *Albizzia odoratissima*, *Albizzia amara*, *Cassia Fistula*, *Acacia Catechu*, *Dalbergia paniculata*, *Wrightia tomentosa*, *Bauhinia racemosa*, *Careya arborea*, *Acacia ferruginea*.

Besides the teak reserve described, we saw other plots stocked with teak trees, and said to be held under patta; and further east, on both sides of the high road, we examined a number of plots well stocked with *Albizzia amara*, also held under patta, and used chiefly as grazing grounds. It is very remarkable that the people here, as in the Udamalpet Taluk, spare the trees standing on their lands, although in this particular locality, the temptation to sell the teak for building

and the *Albizzia* for fuel must be very great. Under existing rules a man might take a piece of such forest land on patta, and might pay the assessment, which varies from 6 to 12 annas per acre, for one year; might cut and sell the trees, realizing a very large sum per acre; and having done this, might relinquish the land. That this is not done more frequently is probably partly due to the feeling that the presence of the trees improves the pasture, partly to the fact that until 1870 the cutting of trees on patta land without special permission was prohibited.

625. In stating my final conclusions on the important subject of fuel reserves in the plains, I shall, as much as possible, adhere to the terms of my note of April last, introducing such modifications as the altered circumstances demand.

626. When writing the note, I hoped that a section would be inserted in the Act, giving authority to declare certain lands at the disposal of Government, reserved lands. Provisions to that effect were recommended by the Committee appointed by Government to prepare a draft Forest Bill, but they were not finally introduced in the Act. An attempt must now be made to attain the object aimed at by rules made under Section 26 and by executive orders. As explained in the general portion of this report, the term " Reserved Lands " may be retained, though it does not occur in the Forest Act.

On the other hand the amalgamation of forests and jungle conservancy has since been sanctioned, and it has also been agreed to make the District Forest Officer the Assistant to the Collector for all forest matters.

These measures having been settled, there ought to be no difficulty in carrying out the proposals submitted by me in April last.

627. Government should now lay down a definite and comprehensive line of policy, the aim of which should be to establish a system under which the waste lands in the open plains, assessed as well as unassessed, so far as they are at the disposal of Government, shall be utilized for the production of wood and cattle-fodder. For this purpose two distinct measures are proposed, which must be kept separate.

The first measure is to make sure that the land which may hereafter be required for forest reserves, and which is at present waste and unoccupied, whether assessed or unassessed, shall not be alienated until it can be decided whether it will be required for the formation of reserves. The second measure is to place selected portions of this land under strict protection, and to stock them wherever necessary by planting and sowing. Such selected portions should be constituted reserved forests under the Act.

Proposals for future action.

628. The first measure, to declare the waste lands at the disposal of Government in a village, in a portion of a taluk, or in an entire taluk, reserved lands, and to prohibit their alienation, must be carried out at once in a wholesale manner; while the second measure, to select the plots for special treatment, to constitute them reserved forests under the Act, to demarcate them and place them under strict protection will require time, and can only be accomplished gradually.

Hence the first move must be to reserve from alienation such Government lands in the taluks, to which these proposals relate, as are likely to be wanted hereafter. In the lands thus reserved no patta should be granted and no squatting should be permitted. Cultivation without patta may be allowed on short leases for a definite term of years. Mirasi rights I am informed are not recognized in Coimbatore; there appears, therefore, to be no objection to reserving these lands by means of an executive order. It will, however, probably be found advantageous to legalize the constitution of reserved lands by rules to be made under Section 26 of the Forest Act.

629. These suggestions regarding the formation of reserved lands are intended to apply only to the dry and open country of Coimbatore, Palladam, Dhárápuram, Karúr and Erode taluks, and to portions of Satyamangalam, Bhaváni, Polláchi and Udamalpet. In those portions of the last named taluks, which adjoin the

hills, and in the taluk of Kollegál such a measure is not called for and is not recommended. In these taluks and portions of taluks the policy must, I presume, be to favor the extension of cultivation. But in the dry portions of the district, where cultivation for the present at least has attained the maximum limit compatible with the well-being of the people, it may be advisable to declare as reserved lands the whole of the Government waste assessed and unassessed in any taluk or portion of a taluk.

630. Under these circumstances it will be well to consider the area of waste lands available for these operations in the taluks to which these proposals are intended to apply. The following figures relate to Fasli 1290 (1880-81), and I owe them to the kindness of Mr. F. Nicholson, who is engaged on the Coimbatore Manual. The areas are given in acres :—

Taluks.	Government Lands in the Plains and smaller Hills.					Total Area of Government Lands in the Plains and smaller Hills.	Percentage of Waste on Total Area of Government Land.
	Occupied.		Unoccupied and Waste.		Total Waste and Uncultivated (Columns 2, 3 and 4).		
	Cultivated.	Uncultivated, Fallow and Grass.	Assessed.	Unassessed.			
	1	2	3	4	5	6	7
Coimbatore	231,942	23,329	78,967	51,213	153,509	385,451	40
Polláchi	178,853	17,498	1,964	14,442	33,904	212,757	11
Udamalpet	138,672	36,925	10,639	15,711	63,275	201,947	31
Dhárápuram	264,321	123,503	20,553	45,318	189,374	453,695	41
Karúr	187,783	78,288	5,004	36,635	119,927	307,710	39
Palladam	250,025	101,021	38,197	40,119	179,337	429,362	41
Erode	231,343	35,775	45,830	39,564	121,169	352,512	34
Satyamangalam	154,975	43,072	266,580	140,588	450,240	605,215	74

631. Mr. Stuart's proposals of the 9th January relate to the areas entered in column 3, the assessed unoccupied lands, and his object was to convert a portion of these lands into forest up to a maximum of 20 per cent. on the total area cultivated. The Board recommended that the Collector should be authorized to set apart 10 per cent. of the total cultivated and uncultivated assessed lands in each village. I have no village statements at my disposal, but a glance at column 3 will show that, so far as the taluk totals are concerned, if we exclude Satyamangalam, it is only in Coimbatore, Palladam, and Erode that 10 per cent. of the cultivated and uncultivated assessed lands is at the disposal of Government. Indeed, in many cases, I feel assured that the area available will be much less.

632. I am disposed to suggest that no limit be fixed, neither maximum nor minimum, but that the Collector be instructed to consider the circumstances of each taluk and to enter in the list of reserved lands all areas which are likely to be useful for the purpose in view. These lists should be notified in the District Gazette, and the grant of pattas in them, without the Collector's special sanction, should be prohibited. This measure should not be confined to the assessed waste. The reserved land should comprise all unoccupied lands which are at the disposal of Government, and which are likely eventually to be useful for the formation of reserves. As urged by the Board in paragraph 8 of their Proceedings of the 16th December 1881, unless a reserve is capable of enlargement to 50 or more acres, it does not seem to give any promise of fulfilling the end in view. The outlay incurred on the protection and on all operations that must be undertaken for the improvement of such small plots, is out of proportion to the good that can be accomplished by such undertakings.

633. It does not, however, follow that only plots of 50 acres and upwards must be selected. In many cases it may be possible to consolidate scattered plots of a smaller size by exchange or purchase, and it may occasionally be possible to form a reserve of the requisite size in the lands of several adjoining villages, although the portion belonging to each village may be of smaller extent. And it will further on be explained that, besides those reserves which should be taken in hand on account of Government, smaller plots may usefully be treated on the system of paying for results, or in another manner.

634. The Board propose that the selection should be made from lands that have been more than eighteen months unoccupied, so that only the poorest lands may be thus reserved. This proposal if adopted will render the task of converting these waste lands into forest exceedingly difficult. It will not be an easy matter to attain success in the hot and dry climate of the Coimbatore District, and, unless the operations are commenced under the most favorable circumstances, failure is unavoidable.

' In the selection of the lands to be reserved no limit whatsoever, either as to area or quality of the land, should, in my opinion, be imposed. The best lands at the disposal of Government, and those most likely to yield good results, should be selected.

635. Before entering upon the discussion of the second point, namely, the measures that should be taken to stock these lands with trees, I wish to draw attention to the figures of column 2 in the above statement. The areas entered in that column comprise occupied lands which are lying fallow, or which are permanently devoted by their holders to the production of fodder and fuel. On my late tour through the Udamalpet and Polláchi taluks of the Coimbatore District, I noticed the large extent of these grazing lands which are held under patta, and for which assessment is paid. Many of these lands which I examined were stocked with scattered trees of babul, *Acacia leucophlœa* and *Albizzia amara*, and in the western portion of Polláchi, with teak and other trees belonging to a moister climate. It will be noticed that the area of these occupied, but uncultivated, lands in Polláchi aggregate 17,000 acres, and in Udamalpet 37,000. In the drier climate of Dhárápuram, Karúr and Palladam, where it is necessary to allow dry fields to lie fallow a long time in order to recover their fertility, the area of these occupied waste lands is much larger.

636. The practice of holding grazing lands under patta is, I am told, of old standing in these taluks. As reported by the District Forest Committee* charged with the selection of reserves in the South Coimbatore hills, the cattle from drier districts go to the private grazing grounds of Udamalpet and Polláchi, paying grazing dues to the holders, whose cattle are sent up to the Anaimalai hills on the southern edge of the district. Many of the grazing grounds held by ryots in these two taluks which I visited were in good condition, and if Government embarks in this business, it is clearly our duty to make the lands operated upon by us more productive than those in the hands of private holders, so that they may serve as examples for imitation by the ryots.

637. It has already been recognized by the Board of Revenue in their Proceedings of the 16th December 1881, that this business will require the employment of a special agency of officers who make forestry their profession. It has also been decided that the administration of forests and jungle conservancy lands shall be amalgamated and that the District Forest Officer shall be subordinate to the Collector; hence there can be no objection to entrusting the work to be carried out for the protection and improvement of these waste lands in the plains to Forest Officers.

It may be objected that of the existing staff of subordinate Forest Officers only a few possess that professional knowledge and experience which would make them more useful for such work than Tahsildars and Revenue Inspectors. To this objection, I reply that it is time now to recognize that Forest Officers, not only of

* Memorandum by the Collector of Coimbatore, dated the 12th October 1878, paragraph 9, (G.O., No. 1612, dated the 2nd August 1879.)

the superior but also of the subordinate branches, must receive special professional education. For attaining this object every facility exists. For the superior staff, by the arrangements made in Europe under the orders of Her Majesty's Secretary of State, while for the subordinate staff the forest school at Dehra Dún offers every facility that may be desired. Assuming, then, that the treatment of these areas will be entrusted to Forest Officers, I may perhaps be permitted to submit a few further suggestions on this subject.

638. The main point which I would urge is that operations should be commenced, not simultaneously on a great many plots, but on a few selected areas under as favorable circumstances as possible. All Indian foresters, even those who have received an excellent professional education, must learn by experience, and I need not prove that, as I say elsewhere, while success is an excellent teacher, very little, as a rule, can be learnt from failure in such operations. Every effort, therefore, must be made to attain success as rapidly as possible on the areas first taken in hand, so as to give the staff employed, down to the laborers, experience and confidence, and to set an example which the ryots will imitate on the grazing lands held by them.

639. Whenever an area has been selected for treatment, the first step must be to place it under strict protection against cutting, cattle and fires. Only after protection has been successful during several years, should money be expended on planting. The present plan of commencing by sowing and planting, which I have found prevailing even in the South Arcot District, where, under Mr. Wooldridge's efficient management, the jungle conservancy lands are in a better condition than in any district visited by me, must be abandoned. The present system is to place those areas only under protection on which money has actually been expended in planting and sowing. The result is that, after the young plants have come up, the cattle visit their old grazing grounds as heretofore, and feed on the tender shoots of babul and other trees. Hence it is necessary that strict protection during a series of years should precede all other operations. Protection must be the first step, and the expenditure of public money on planting and sowing must be the second. This plan has other advantages. Under strict protection grass and brushwood are sure to spring up, and this will afford shelter to the young plants artificially raised. In some cases it may be found advantageous to sow the seeds of trees together with oil-seeds or millet for shelter, but the discussion of this and other matters of detail would lead me too far on the present occasion.

640. To recapitulate, the chief aim must be, after the selection of the reserved lands has been made, to concentrate the efforts of the staff upon a small number of carefully-selected areas, which must be brought to a high state of productiveness as speedily as possible. When this end has been accomplished, and when in each taluk a few model forests have in this manner been established, it will be time to consider what should be done with those plots which are too small to be taken in hand by Government agency. On these, very likely, it will be found expedient to pay for results, either by giving the land free of assessment for a fixed number of years, on condition that it be planted up, or in some other way. I have seen in several districts groves of palmyra and other trees which had been successfully raised on such terms, but it is evident that the conditions of such a contract can be enforced much more effectively if Government can show that success is possible and has actually been attained, in the manner desired, on the areas taken in hand by Government agency. Or it may eventually be possible to constitute them village forests to be managed by the villagers at their own expense and for their own benefit, such management being under the control of the Government Forest Officers.

641. The necessary skill and experience on the part of officers and workmen can only be acquired gradually, and hence the plan here sketched will require a long series of years to attain the ends aimed at; but it is much better to aim at satisfactory results by slow and steady work, than to court failure by attempting to operate upon a large number of plots at once. Obviously, however, it is essential in the first instance to make sure that the areas which may hereafter be required

for this purpose are not alienated, and the sooner this work, namely, the setting apart of reserved lands in those taluks where they are required, the sooner I say this plan is commenced, the better. It does not at all follow that these reserved lands shall remain unused and locked up, so to say, until they are either included in the areas for special treatment, or excluded from reserved lands and given out on patta, for they may be leased out on short leases for a definite period, and may in this manner be utilized. In the Government waste, which, if the present proposals are accepted, will be declared reserved land, there are many tracts with shallow soil not suitable for forest growth, though they may yield dry crops. Such tracts may be leased out for cultivation.

Bolampatti Forests.

642. The Nóyil river which joins the Cauvery 24 miles below Erode, rises in the hills which surround the Bolampatti valley, west of Coimbatore. The river irrigates 16,366 acres in the Coimbatore and Palladam taluks, a large portion of which near Coimbatore and above the town consists of gardens of cocoanut and areca palms. The climate of these two taluks is hot and dry, the mean annual rainfall being at Coimbatore 21 and at Palladam 17 inches, and the productiveness of the irrigated lands, and with them the prosperity of Coimbatore, mainly depends upon the water-supply in the Nóyil river.

Water-supply of Nóyil River.

643. The total catchment area of the Nóyil river is 1,356 square miles, of which only 60 square miles are in the hills. The irrigation from this river chiefly depends upon the catchment area above the Chitrachávadi anicut (90 square miles), the mean annual rainfall of which may be estimated at from 25 to 125 inches. The flood-water is most carefully stored in the large tanks near Coimbatore, and I have not heard that the irrigation in the Coimbatore taluk has diminished. But in the Palladam taluk, there is no doubt that irrigation has decreased. Before the settlement the land assessed as irrigated was 3,707 acres, and this was reduced in 1878-79, by the Settlement Department, to 2,701 acres, by the transfer of 1,006 acres to dry. The Tahsildar of Palladam has informed me that the greater part of the land now classed as wet may properly be transferred to dry, as the water-supply is hardly sufficient to irrigate as much as a quarter of the land classed as wet.

He adds that except in the rainy reason, there is only a very scanty flow in the river, and during several months it is entirely dry. Depositions, which the Tahsildar has taken in 9 villages, show that up to 1845, the supply of water in the channels was sufficient to irrigate the land thus classed as wet, and that the supply has gradually decreased since that time. During the past 20 years there has generally been no wet cultivation except in the three upper villages, Udayapaliam, Irugur and Sulúr.

644. The large area irrigated from the Nóyil river near the town of Coimbatore is derived from a number of tanks in which the flood-water is stored, and the existence of these tanks might be held to prove that the Nóyil was not considered a river with a steady supply. Some of the tanks receive water from surface drainage independent of the main river.

But the tanks are dry during a considerable portion of the year, and the palm gardens as well as a portion of the field irrigation depends, not upon the tanks, but upon the permanent flow of the river, and this, there seems every reason to believe, has diminished.

Causes of its decrease.

645. The decrease in the water-supply of the Nóyil is by some attributed to a diminished rainfall, but this is not supported by definite data. The diminished

dry weather water-supply, if such has really taken place, is much more likely due to the denudation of the head of the valley and of the hills surrounding it. No certain data are, however, available to prove the extent of this decrease, or the reason to which it may be due, but the denudation within the last 20 or 30 years is undoubted, and we are justified in assuming that if the head of the valley and the hills surrounding it were reclothed with forest, the dry weather water-supply in the Nóyil would improve, and less sand and silt would be brought down by the river.

646. In another part of this report it has been recommended to establish a regular system of observations on this river, to ascertain, as accurately as possible, the rainfall of the year upon the catchment area above a certain point and the discharge at that place during the same period. At the same time I am of opinion that the most strenuous efforts must be made to constitute, as reserved forest under the Act, whatever land may still be at the disposal of Government at the head of the Bolampatti valley, and on the hills surrounding it, and to place these areas under strict protection. If this is really accomplished, then the forest of which the remains are still left, will doubtless recover and will again grow up thick and dense as before, and there is every probability that the observations proposed to be made will year after year show a steady improvement in the water-supply during the dry season. Nor will this and the diminution of silt and sand in the river be the only advantages gained by forest protection. A large portion of the firewood and small building wood consumed at Coimbatore and in the numerous large villages in the vicinity of that town is brought in from the Bolampatti valley, and as the forests improve, the wood can be cut on a smaller area and its supply will be more plentiful. Mr. Peet estimates the quantity of firewood annually imported into Coimbatore at 15,000 tons.

Moreover the water-supply in the smaller streams which descend from the hills will be improved, and the fields below and in the vicinity of the reserved forests of the Bolampatti valley will be more fertile and more productive.

I have not, during the whole of my Indian experience, seen any case in which the necessity of forest protection seemed more urgent.

The head of the valley, the greater part of which 20 or 30 years ago was stocked with heavy forest, has been almost entirely cleared, and on the hills the *kumri* clearings of the Irulars and Mudavars, and the annual jungle fires lit by the herdsmen, have greatly reduced the forest area. Unless exceedingly energetic steps are taken at once in order to put a stop to encroachments and denudation, the irrigation of the Nóyil river may be most seriously affected.

Area available.

647. The area which it is probable will, on enquiry, be found to be at the disposal of Government at the head of the valley may be estimated at about 10,000 acres above the Ookalam tank. In this area are included, as far as is at present known, the following private lands:—

(i.) About 350 acres on the Poráthi saddle road formerly a coffee plantation made by the late Mr. Thomas and now in possession of one Andu Sait.

(ii.) Part of the southern slopes of the Vellingiri hill, belonging to the Jaghirdar of Vallaymallaypatanam; about 1,200 acres.

But in many places besides, squatters have settled, and I much fear that other claims to land may be brought forward when the Forest Settlement Officer commences his enquiry.

The greater part of the forest on the hills at the head of the valley is dry and deciduous with much bamboo (*Bambusa arundinacea*), which has lately flowered and seeded. In this forest there are still a few trees of teak and vengay left, but most of the valuable trees have been cut out.

Only near the crest of the hill and in a few of the deeper valleys is any considerable extent of evergreen shola forest remaining, and this is broken up by grassy slopes and by *kumri* clearances made by Irulars and Mudavars. At the foot of the hills the trees left standing are of large size, indicating what excellent forest must have been here on the ground in former years, but most of this has (as already stated) been cleared away.

648. Here, as elsewhere, the evergreen forest is the most valuable for regulating the water-supply, but the total area of this description of forest on the Nóyil side of the valley probably does not exceed 1,000 acres. North of the valley the slopes are mostly rocky, precipitous and bare, and the total area which may here be available to be included in the reserved forest probably does not exceed 4,000 acres.

South of the valley is a long but narrow strip of dry rocky slopes with a few patches of shola forest at high elevations, where it is probable that about 5,000 acres draining into the Nóyil river may be available. If altogether from 25 to 30 square miles in this valley, including the slopes to the top of the ridge, can be constituted a reserved forest, a most satisfactory result will have been achieved.

649. Simultaneously with taking up the lands which constitute the catchment area of the Nóyil river, an attempt should be made to constitute as reserved forests the hills further north, from which the Sanganur stream (Sanganur Pollam) takes its rise, and which enclose the valley of China Tadágam.

It will also be well to take this opportunity to demarcate and constitute, as reserved forest, the southern slopes of the hill range which bounds the Bolampatti valley on the south. A small forest at the foot of these slopes near the railway, called the Sholakarai reserve, has been demarcated as a railway fuel reserve, it is surrounded by a ditch, and has been fairly protected against indiscriminate cutting. Cattle, however, have not been kept out, and fires but partially.

650. The object of including the southern slopes of these hills within the reserve is twofold; to furnish timber for sale, portions being fairly well stocked with teak and vengay; and, if necessary, to provide lands for *kumri* clearings for the Irulars and Mudavars of the Bolampatti valley.

The existence of these tribes at the head of the Bolampatti valley will, I fear, be found to be a real difficulty when the Forest Settlement Officer commences his proceedings. Some land for *kumri* cultivation has already been allotted to them; but I am not acquainted with the exact conditions under which this has been done. The total area available at the head of the valley is so small that an effort must be made to prevent further *kumri* clearings in Government forest; and hence I would suggest that land might be offered to them in exchange on the southern slopes towards the Walliar river, which river, as it runs westward to the coast, is not required for irrigation to the same extent as the rivers which flow eastward.

651. After the lands at the head-waters of the Nóyil river, as far as they are at the disposal of Government, have been constituted reserved forests; and after all adverse rights have, as far as possible, been bought out or settled, the first step will be to protect the forest against fire. This can only be effected gradually by taking in hand one block after another. The most convenient plan will be to commence on one side of the Poratti saddle road, and to limit this block by making a second road up to the ghâts parallel to the existing road and at a distance of a few miles from it. The fire-lines, running from the foot of the hills to the crest of the ghâts, should run along these roads and they should be joined by a fire-line along the crest and a second line at the foot of the hills.

These operations will, at the outset, require the presence of a responsible officer in the valley in the hot season, and in order to enable him to live there without risk to himself, a good rest-house must be built as soon as possible in a healthy locality at the head of the valley.

Amravati Forests.

652. The work next in importance to the demarcation and protection from fire of the Bolampatti forests, is to take the necessary steps for protecting the hills on the southern border of the Udamalpet taluk which drain into the Amrávati river.

This river irrigates a large area, which in Coimbatore is stated to be 25,104 acres, and in all probability its satisfactory water-supply is chiefly due to the vast extent of evergreen forest covering its head-waters in Travancore. Over these forests Government has no control, and it is not impossible that the operations of the North Travancore Land Company may have the effect of clearing this forest and thus of damaging the irrigation. Some feeders of this river take their rise in the Retayambádi mittah in the Madura District. These also are beyond our control, but that portion of the Amrávati catchment area which is at the disposal of Government in the hills of the Coimbatore and Madura Districts should be constituted a reserved forest under this Act and placed under efficient protection. The Conservator informs me that the whole of those forests are included within the area recommended to be reserved by the District Forest Committee of Coimbatore and Madura and sanctioned by Government.

Bhavani River.

653. The third river which requires the attention of the Forest Department in the Coimbatore District is the Bhaváni. This river has an abundant water-supply during nine months of the year, and a smaller but steady supply from February to April. It contributes largely to the supply of the Cauvery river, and it irrigates about 26,000 acres in the Satyamangalam, Bhaváni and Erode taluks. But a portion only of its water is as yet utilized. This satisfactory state of things is probably due to the fact that the Moyár river derives its chief water-supply from the swamps and sholas of the Nílgiri plateau, and that the Bhaváni itself drains the Kundahs and the southern slopes of the Nílgiris, as well as the Atapádi valley, the higher portions of which are stocked with evergreen forest. Under existing circumstances the duty of protecting the water-supply of the Bhaváni rests chiefly with the Forest Officer on the Nílgiris and with the authorities in Malabar.

654. Considering the peculiar position of the Atapádi valley, it seems to be a matter for consideration whether it should not be included in the Coimbatore District, because the authorities in that district have the greatest interest in taking such measures as the circumstances of the case may admit to prevent the denudation of that valley. The valley is thinly inhabited by Irulars and other hill tribes. For those who live near the head of the valley, Manárghat in Malabar is, I understand, the chief market, and the Atapádi valley has, ever since the annexation of the country, formed part of Malabar. But geographically the valley belongs to Coimbatore, and its chief use at present is to serve as the grazing ground for the cattle from that district.

Anaimalai Forests.

655. The river which drains the Anaimalai hills irrigates some land in the Pollách taluk (4,610 acres), but it is not on this account that the protection of the Anaimalai forests is necessary. The town of Pollách is one of the largest inland timber marts in this Presidency. On my visit in March last I was surprised to see the large stores of magnificent timber—teak, blackwood and numerous other kinds lying there. Formerly the timber was carted across from here to Trichinopoly, Tanjore and Madura. At present it is carted to Dindigul or Coimbatore and from thence sent on by rail. The timber is brought from the forests below ghât in Malabar and Cochin, and it seems not impossible that the timber from the adjoining Anaimalai forests, which are partly leased, partly the property of Government, might be brought for disposal to this place.

656. Teak from Burmah competes successfully with the timber from these forests, not on the east coast only, but as far inland as Coimbatore. During the seven years ending 1881-82, the average annual imports into Madras of teak from Burmah was 9,554 tons; and timber from Ceylon also is imported to a considerable extent at all the ports between Madras and Tuticorin. The following is an abstract of the returns received from the different ports:—

Ports.	Number of Years.	Average Imports.		Remarks.
		Tons.	Rupees.	
Madras	5	484	...	
Pondicherry	5	...	25,900	Palmyras, satin, palu.
Cuddalore and Porto Novo	5	...	43,323	Wood manufactures.
		150	3,995	
Madura, Tondi	1	2,574	74,875	Palmyras, satin, palu, &c.
Madura, Devipatnam	1	120	3,510	Satin, palu, &c.
Madura, Kolakarai	4	162	3,850	Palmyras, bamboos, &c.
Tuticorin	5	419	4,322	Palmyras, palu, &c.

Palmyra stems are used for rafters, and of the timbers the most important are Trincomali wood (*Berrya Ammonilla*), the Ceylon ironwood called palu or pali (*Mimusops indica*) and satinwood (*Chlorcæylon Swietenia*).

657. I do not wish to imply that the Anaimalai timber ought to compete at the eastern ports with teak from Burmah and timber from Ceylon. But much of the imported timber goes inland from the east coast, and there seems to be an opening for developing an outlet for the Anaimalai timber in this direction. The question is probably chiefly one of roads and good management. The Conservator informs me that a system of selling timber in the Anaimalai forests, the purchasers removing it, has been set on foot. The next step in this direction must be to ensure a good natural reproduction of teak and other valuable kinds in those forests, and this cannot be accomplished without protecting selected portions against fire. By reducing the charges for the carriage of timber, the railways might increase this traffic and might facilitate the export of timber from the Anaimalai and other forests.

More I shall not say, as I have seen too little of these forests to form any definite opinion regarding their management.

CHAPTER XIII.

NILGIRIS.

658. The Nílgiri District, as at present constituted, is estimated to contain an area of 612,480 acres. The Assistant Superintendent of Revenue Survey, in charge of the party employed in the district, has furnished me with the following statement, showing the distribution of private holdings and land at the disposal of Government in the different divisions of the district:—

Divisions.	Locality.	Area of Private Land.	Area of Land at the disposal of Government.		Total Area.	Remarks.
		ACRES.	ACRES.		AC ES.	
1. Merkunád	Plateau and Slopes.	28,255	30,989	311,510 acres.	59,244	
2. Tódanád		35,705	166,357		202,062	
3. Ootacamund Settlement		10,473	8,825		19,298	
4. Paranginád		31,779	41,355		73,134	
5. Coonoor Settlement		3,613	3,698		7,311	
6. Kótagiri Settlement		5,639	2,000		7,639	
7. Kundas		6,187	58,286		64,473	
8. Ouchterlony Valley	S. E. Wynaad.	25,363	..	36,133 acres.	25,363	
9. Nambolukód		* 88,847	178		89,025	* Area of Mudumalai leased forest, 46,701 acres, is included.
10. Munanád		18,036	† 20,632		38,668	† Area of Government Benne teak forest, 10,484 acres, is included.
11. Cherankód		10,883	15,323		26,206	
Total ..		264,780	347,643		612,423	

The population according to the Census of 1881 was 91,034, or 95 persons to the square mile.

659. Apart from the Cinchona Plantations, with which I had no concern, the following matters deserve attention in the Nílgiri District from the Forester's point of view :—

(1.) The management of the forests in South-east Wynaad—particularly of the Benne teak forest (Government property) and of the Mudumalai leased forest—for the supply of teak and other timber to Ootacamund and other stations on the Nílgiris.

(2.) The protection of the forests on the plateau and slopes, in order to maintain the water-supply in the feeders of the Moyár and Bhaváni rivers.

(3.) The formation of new reserves on the plateau, on high ridges and exposed slopes, and the gradual planting up of these reserves with fast-growing (Australian) trees with the object of improving the water-supply in springs and streams, and to afford shelter against winds to fields and plantations below them; and in order to produce an abundant supply of fuel for local consumption, for the use eventually of the railway, and possibly also for iron-smelting.

(4.) The disposal of waste lands by Government.

I have nothing to say regarding the South-east Wynaad forests, and shall limit my remarks to the last-named three points.

Rainfall.

660. The following figures state the mean annual and monthly rainfall in inches for different stations on these hills. The figures for Wellington were taken from Mr. Blanford's report for 1880; those for Dodabetta, Hulikal Drug, Kodanád, Madanad, Seaforth, Liddellsdale, and Terrace were kindly furnished me by the Proprietors and Managers of these estates, while the rest were taken from the District Manual; the figures for Kaity and Ootacamund being supplemented by those recorded in Mr. Robertson's report of 1875 on the agriculture of the Nílgiris. The distribution of moisture and rainfall on these hills will, if studied in detail, be found to be a most interesting subject. When this study is undertaken the original records from which the figures were taken for the District Manual, will have to be examined, for there are errors in the Manual entries for Kaity (1873), and mistakes may have crept in elsewhere.

Stations.	Elevation above Sea Level in Feet.	Number of Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.	Remarks.
A. Rainfall equally from both Monsoons.																
1. Dodabetta	8,642	3	1·14	·87	1·13	5·77	6·31	6·93	11·69	12·48	11·91	11·19	8·34	3·12	80·88	From District Manual, page 49.
2. Ootacamund	7,400	10	·70	·46	1·20	3·02	5·43	6·22	5·66	4·38	4·65	8·17	3·69	·92	44·50	From District Manual, page VII (Appendix) and Mr. Robertson's Report, 1875.
3. Kaity	6,500	5	·07	1·54	1·97	2·99	7·59	4·61	4·02	3·75	6·53	7·52	4·41	1·81	46·81	
B. Rainfall chiefly from North-east Monsoon.																
4. Hulikal Drug (Mr. Mullaly's Estate) ..	6,000	3	3·18	1·51	3·48	3·03	3·65	2·22	3·70	4·24	3·72	13·35	18·26	3·93	64·27	Communicated by Mr. Fred. Mullaly, junior.
5. Coonoor	6,000	6	3·50	4·45	1·26	4·98	5·72	3·31	3·10	3·30	5·77	11·36	15·45	4·79	66·99	From District Manual, page VII (Appendix).
6. Wellington	6,100	4 to 6	·28	·61	1·90	4·58	3·93	3·74	3·05	2·74	3·34	8·33	7·97	4·00	44·47	From Mr. H. F. Blanford's Report for 1880.
7. Melkunda	6,900	5	·20	2·14	1·07	3·03	5·80	4·09	5·88	2·75	4·02	9·66	9·78	4·28	52·70	From District Manual, page VII (Appendix).
8. Kodanád (Mr. Hill's Tea Estate) ..	6,500	9	·60	1·53	2·24	2·47	8·16	3·70	3·90	4·26	5·74	11·97	8·08	4·12	56·77	Communicated by Mr. James Hill.
9. Madanád (Mr. Hill's Coffee Estate) ..	4,500	7	·87	1·45	3·15	2·22	5·67	1·48	2·33	1·81	4·06	10·49	7·26	6·08	46·87	
C. Rainfall chiefly from South-west Monsoon.																
10. Liddellsdale Estate	6,900	7	·6	·24	1·04	1·74	7·36	15·89	23·53	19·38	9·87	6·90	2·89	·95	89·93	Communicated by Mr. Wm. Teare.
11. Terrace Estate	7,200	4	·12	·35	·58	1·31	13·14	19·49	26·89	25·38	13·22	7·93	4·77	·86	114·	
12. Naduvatam	6,000	6	·14	·22	·97	2·43	5·20	17·77	36·18	18·02	12·25	7·57	2·41	·44	103·60	From District Manual, page IX (Appendix).
13. Ouchterlony Valley (Captain Griffin's Seaforth Estate)	3,600	17	·31	·32	1·23	2·84	6·83	19·42	23·19	16·72	11·96	9·74	3·24	1·12	96·92	Communicated by Captain Alfred Griffin.

661. The first point which merits notice is that the stations near the southern and eastern edge of the plateau receive their rainfall chiefly during the three months from October to December, or during the north-east monsoon, while they receive a less quantity during the south-west monsoon from May to September. There is also a good deal of rain from January to April, or during what in the plains would be the dry season. Kodanád being situated on the extreme north-east corner of the plateau is an exception, as it is exposed to the south-west monsoon which comes down the Moyár Valley. The mean totals of rainfall during these three seasons are as follows:—

Stations.	January to April (4 months).	May to September (5 months).	October to December (3 months).	Year.
	INCHES.	INCHES.	INCHES.	INCHES.
Hulikal Drug	11	17	36	64
Coonoor	14	21	32	67
Wellington	7	17	20	44
Melkunda	6	23	24	53
Kodanád	7	26	24	57
Madanád	8	15	24	47

On the other hand the stations on the north-western edge and in the Ouchterlony Valley have a dry season during five months from December to April, with heavy showers in April, and a rainy season from May to November, which is due chiefly to the south-west monsoon.

Stations.	December to April (5 months).	May to November (7 months).	Year.
	INCHES.	INCHES.	INCHES.
Liddellsdale	4	86	90
Terrace Estate	3	111	114
Naduvatam	4	99	103
Seaforth	6	91	97

Lastly, the centre of the plateau has a dry season from December to March, and a moderate and equable rainfall during the rest of the year, which is due to both monsoons, and which rarely comes down in heavy showers but mostly in a light rain or drizzle. Dodabetta being an isolated high peak is exceptional. The figures of the two other stations are as follows:—

Stations.	December to March (4 months).	April to November (8 months).	Year.
	INCHES.	INCHES.	INCHES.
Ootacamund	3	41	44
Kaity	5	42	47

662. The climate of these hills is equable in a remarkable degree, and this manifests itself in the prolonged flowering time of many of the trees and shrubs which are indigenous here. The following observations made during the last season on the plateau may have some interest.

Hypericum mysorense, the beautiful shrub, with decussate leaves and large golden-yellow flowers, which springs up in abundance on all Badaga clearings and fallows, was in flower in March last year and continued so until October. *Rhodomyrtus tomentosa*, the Nílgiri gooseberry, a myrtaceous shrub which is common all over the plateau above 5,000 feet, was covered with its pink flowers during the same period. *Photinia Lindleyana*, a rosaceous tree, bearing corymbs of pinkish white flowers and bright red fruit, came into flower in June and commenced again in October after the heavy rains had ceased. *Millingtonia pungens* had its large pale-yellow panicles out in June and July and again in October.

This remarkable character of many trees and shrubs on the Nílgiris is particularly striking in the case of certain kinds, which are found both on these hills and

in the North-west Himalaya. Thus the two brambles, which are common to both hill ranges, *Rubus ellipticus* and *Rubus lasiocarpus*, have last season been in flower from the middle of March until October, while, for instance, near Simla a fortnight or three weeks is their usual time of flowering. *Rhododendron arboreum* also, which, though it has been described as a separate species under the name of *Rhododendron nilagiricum*, is the same as the common Rhododendron of North India, continues in flower much longer on the Nílgiris than on the North-west Himalaya. The equable temperature and the even distribution of the moisture almost throughout the year, excepting only the three first months, January to March, which are generally dry, are probably one of the causes of the extremely rapid growth here of the blue-gum and some other Australian trees, which will be mentioned further on.

Waste Land at the disposal of Government.

663. The determination of what is and what is not waste land at the disposal of Government has been a source of difficulty on the Nílgiris. It has been at times supposed that the Todas had such a right to the extensive waste lands over which they have grazed their cattle that they were entitled to compensation when such lands were taken up for cultivation or other purposes. That idea is not now entertained. Pattas have been granted to the Todas for the grass and forest land in the immediate vicinity of their settlements (munds), and they may also use for grazing the Government waste lands in the vicinity of their settlements, as long as they are not alienated under the waste land sale rules or otherwise; but further than this their rights do not extend.

664. The rights of Government to the waste land on the plateau have been considerably interfered with by the shifting pattas held by the Badagas, Kotahs and other cultivating tribes. This system is thus described on page 316 of the District Manual :—

"The State allowed the hill cultivator to occupy a tract, five or even ten times greater than the portion for which he actually paid assessment, and which was shown in his annual patta. These several tracts might be miles apart, and sometimes even in different *Nâds* or villages. 'Grazing pattas' were also allowed under which the ryot could hold grass land up to one-fifth of his regular holding at one-quarter of the ordinary rate of assessment. In the Kundas there were 'hoe' and 'plough' leases under which the ryot could cultivate any land on payment of the assessment for the number of hoes or ploughs which he used."

665. The result of these peculiar tenures has been that valuable lands, which should have belonged to Government, have been alienated by private persons on the strength of pattas, which in many instances referred to lands quite different from those so disposed of. Shifting pattas were prohibited by order of Government in 1862, as a preliminary to the introduction of the waste land sale rules, and, as compensation to the ryots, the rates of assessment were lowered, and the cultivators were given possession, once for all, of whatever area they chose to occupy. But, as matter of fact, from the absence of survey and the insufficiency of the Revenue Staff, the shifting system continued. The Irulas and Kurumbars on the slopes have continued to shift their cultivation, and it has been usual even for the Badagas and Kotahs, whose habits are more settled than those of the other tribes named, to retain possession of a much larger area than that for which they pay assessment. The recent survey and the settlement now in progress are intended to fix definitely the position and extent of each patta holding, and this will render impossible the fraudulent disposal of pretended patta land, which has hitherto been so common.

666. Under this settlement, a ryot who holds a larger area than that stated in the patta is usually given the option of throwing up the excess land, or, if the occupation of the land is otherwise free from objection, of retaining it, in which case assessment is paid at the old or more favorable rate, which generally averages five to six annas an acre; but if the excess is large the rate of assessment on the whole field is sometimes raised by a few annas per acre. At the time of settlement, small patches of Government waste land adjoining private holdings may be given to the occupants of these holdings at an assessment of ten annas an acre in the case of native cultivators, and at the rate of Rs. 2 an acre in the case of planters. All

other lands must be taken up under the waste land rules of 1863. Since 1863, District Officers have not been permitted to grant land on patta.

667. The Badagas, as a rule, have two classes of fields: *first*, permanent fields in the vicinity of their villages, which are manured, and where wheat, barley, onions and sometimes ragi (*Eleusine coracana*) are grown; and, *second*, lands on the slopes of the hills which are allowed to lie fallow after having yielded a crop of millet, generally korali (supposed to be *Setaria italica*) often mixed with sami (supposed to be *Panicum miliare*). In more remote localities fields are allowed to lie fallow for a series of years, and such fallows get gradually covered, first with bracken (*Pteris aquilina*), and afterwards with scrub of *Dodonæa*, *Hypericum*, *Berberis* and brambles.

Large Areas held by Badagas.

668. Under the present settlement all land occupied by the ryot will be assessed and the assessment will be paid, whether the land is fallow or cultivated, and the effect of this will, I understand, be very largely to increase the total assessment that will be paid by the Badagas. But as said before, Badagas who, at the time of settlement, are found to hold land in excess of their pattas are usually, if there is no objection, permitted to retain such land at the old or lower rate of assessment. The result is that, even after settlement, very much larger areas will be held by the Badagas than are actually cultivated. This accords with their system of husbandry and would of course be unobjectionable, if the assessment paid by them were not so exceedingly low. It seems to me that the result of this low assessment must in many cases be to lock up large areas which might be utilized to greater advantage if the assessment were higher. At the rate of 5 annas an acre the Badaga can afford to occupy large areas which yield him a very small return.

669. Were the assessment higher, he would be compelled to build terraces, to plant trees on the edges of his fields, and to cultivate his land more intensively. The contrast between the slopes cultivated by the Badagas on the Nílgiris in their slovenly fashion, and the fields and gardens of the people in the Himalaya, all carefully terraced, with trees near the villages and on the edges of the fields, often irrigated by canals many miles long, is very remarkable, and it is not at all impossible that a higher rate of assessment might eventually induce the Badaga to improve his system of husbandry.

670. It must be borne in mind that soil and climate are most favorable on the Nílgiris, and that the prices of grain are exceptionally high. Taking these circumstances into consideration it would not seem unreasonable that the Badagas should pay a high assessment. Moreover, if they could be induced to cultivate their fields more intensively, larger areas would be available for European settlers on the hills, and this obviously is a matter of very great importance. It might be objected that the Badagas cultivate their lands as intensively as the labor at their disposal will permit, that they find more lucrative employment by working as coolies on plantations, and have not much labor to spare for their own fields. This objection, however, does not apply to the large extent of country without plantations on the north-east portion of the hills, between Ootacamund and Kodanád, which is occupied by numerous and large Badaga villages. And in any case the more intensive cultivation of the fields near their villages would probably yield the same weight of crop with the same number of hands as the present system under which a large proportion of the fields is miles away from their villages.

671. Mr. Robertson, in his report on the agriculture of the Nílgiris of 1875, states, with reference to the barley grown by the Badagas, that he saw few crops that would yield fifteen bushels per acre, and that the majority which he saw would not yield six bushels, while fifty to sixty bushels per acre are obtained in England, under, as he justly observes, natural circumstances of a far less favorable kind than are met with in many parts of the Nílgiri District for barley cultivation. The soil on the Nílgiris is excellent, the climate most favorable, and at first sight there seems no reason why wheat and barley on the Nílgiris should not yield as heavy crops as in England.

Mr. Robertson also justly draws attention to maize which thrives well on these hills, and which has become a staple crop in the North-west Himalaya, at similar

elevations, over a large part of the country, including Native States and remote districts.

672. In connection with these remarks it merits notice that korali, the staple crop of the Badagas, has an exceedingly slow growth. It is sown in March and does not ripen until November, thus requiring from eight to nine months to come to maturity. During this long time it requires incessant weeding as it does not grow with sufficient rapidity to suppress the weeds. The object of the first weeding in April and May is to take out the dry tufts of grass and herbs, which had grown up while the land was fallow, and which were turned over when the land was broken up. Great labor is bestowed upon this operation, which one might be disposed to think was hardly necessary. But the Badagas say that if these dead roots and tufts of dry grass are not removed, the disease will get into the crop, and they are most careful to heap them up on rocks on the roadside or in other places, away from the growing crop. At a later period the weeding of bracken and herbs, which spring up plentifully among the thin and slow-growing korali, is incessant, and long strings of men, women and children are seen constantly squatting in the fields engaged in this operation; and this work, which generally has to be done at a considerable distance from the village, must occupy a large portion of the available labor. Except on the *toungyas* in Burma, where the rich soil, made richer by the ashes of the burnt forest, produces an immense growth of weeds during the five or six months which the hill rice requires to attain maturity, I have not often in India seen a crop which requires more weeding than this slow-growing millet, which covers such vast areas on the Nílgiris, and which gives such a poor crop in return for such an immense amount of labor. It seems not impossible that by more intensive cultivation the Badagas might produce the same quantity of grain with much less labor.

Waste Land Sale Rules.

673. The waste land sale rules for the Nílgiris were introduced by order of Government in 1863. They apply to all lands to which no "claims of private proprietorship, or exclusive occupancy, or any other right, incompatible with the sale of the land by Government," are proved; but no reserves of grazing or forest land, nor land reserved for building-sites, parks or recreation grounds are to be disposed of under the rules, without the special sanction of Government. Rights of way, or rights in streams bounding the lands sold, or included within them, are also reserved. It is intended that the rules shall be used in cases where waste land is applied for to form plantations, and Government reserve the right to dispose of waste land in the usual way on patta, kowl, or otherwise. These powers have not been delegated to the District Officer, but during settlement, the Settlement Officer has been authorized to grant land on patta, provided it adjoins the applicant's holding. The area of each lot to be applied for is limited to 500 acres (in towns to 10 acres). The lot must be compact, and, where it touches a road or stream, the length of frontage must not be more than half the depth of the lot; but there is no limit to the number of lots which may be applied for by one person. The lots applied for are demarcated and surveyed at the expense of the applicant, and, after notice, put up to auction with an upset price representing the cost of demarcation and survey, and sold to the highest bidder, to whom a title-deed is granted. The lands thus sold are subject to an annual assessment of eight annas per acre for grass land and scrub, and Rs. 2 per acre for forest land. All the available forest land however having been reserved, under orders which will be noticed hereafter, the application of the rules is now confined to grass land and scrub. The title to the land may be converted into freehold by the payment of twenty-five times the annual assessment. The land is then free from all but local taxation. The area disposed of under these rules, up to 1878-79, is stated, on page 360 of the District Manual, to have been 15,373 acres in 369 lots. The price realized was Rs. 1,04,590, or about Rs. 7 per acre.

Firewood Allotments.

674. In 1869, when the present tope or tree-planting rules were introduced, under which in other districts persons desirous of planting trees are allowed to

have land for this purpose free of assessment for 20 years, the Commissioner of the Nílgiris proposed that a limited area of grass land should be granted, on favorable terms, for planting trees for firewood in this district. Government thereupon sanctioned the grant of 1,500 acres near Ootacamund, 1,000 near Coonoor, and 500 near Kótagiri, in blocks of 10 acres, with a maximum allotment of 50 acres to any one individual, and ordered that, on account of the rapid rate of growth of Australian trees, the time during which the land should be given free of assessment should be 7 years, after which the ordinary assessment for grass land of one rupee per acre should be charged and a title-deed issued. The leases were burdened with a liability to the resumption by Government of the land if 500 trees were not planted to the acre, and if within the first three years half, and within the next four years the whole of the allotment was not planted up.

675. On these terms, 393 acres were allotted to fourteen persons near Ootacamund, and 113 acres to two persons near Coonoor, between 1871 and 1874. The greater part of the allotments, however, have lapsed to Government, owing to the non-fulfilment of the conditions of the leases. Government have recently (G.O., dated the 11th March 1882) cancelled the rules under which the allotments were made, on the ground that private plantations having sprung up in all directions without special concessions, the rules were no longer necessary.

Under the order of Government of 1869, already mentioned, sanction was given for the grant of land free of assessment, under paragraph 2 of the tope rules, to any villages on the hills, the inhabitants of which should combine to form cinchona plantations for their common benefit. With insignificant exceptions no use has been made of this concession.

Natural Forests.

676. The question of preserving the indigenous forests on the Nílgiri plateau and slopes attracted the notice of Government soon after the establishment of the station of Ootacamund, and in 1837 orders were issued prohibiting the cutting of timber and forest trees in any place within the limits of what was then the Military Settlement of Ootacamund, where they were ornamental or were likely to maintain the dry weather water-supply in springs. But no protective establishment was then appointed, and it is stated that much damage had been done to the sholas by the time (1852) that it was thought necessary to issue further orders on the subject. In that year, when Mr. E. B. Thomas was Collector of Coimbatore, in which district the Nílgiris were then included, a small forest establishment was entertained, and Government ordered the preparation of a set of rules for conservancy by the Collector and Dr. Cleghorn. But cutting in the sholas without payment was allowed to continue, till in 1860 the Government, on the report of the Collector and Conservator of Forests, decided on the absolute reservation of the sholas near Ootacamund and Coonoor on their demarcation, and the exclusion of private wood-cutters,—all cutting being done departmentally and the wood sold in auction,—and on gaps being planted up. It was also ordered that woods more distant from the stations should be divided into lots, some of which, sufficient for one year's supply, should be annually sold to contractors with permission to clear them of everything but specially marked trees: The blocks so cleared were to be planted up by the Forest Department. That Department was at the same time strengthened, and soon after a Deputy Conservator was appointed to the charge of the sholas and plantations and of the Mudumalai and other forests at the foot of the hills in what was then Wynád.

677. These measures were not, however, sufficient to check the destruction of the sholas, and in 1869 the Government, on the representation of the Commissioner of the Nílgiris, which had then been made a separate district, placed the management of the forests under the Revenue Officers, with the assistance later on in the same year of a special officer. The Jungle Conservancy rules were at the same time introduced for the management of the woods on the plateau. The Nílgiris were under Jungle Conservancy until 1875 when they were retransferred to "Forests." As plantations of coffee, tea and cinchona extended, the demand for shola land increased, and large areas of forest were alienated under the waste land sale rules

and cleared. Much forest land was also sold to planters by Badagas on the strength of pattas, which, in many cases, did not at all relate to the land sold. At the same time, there was delay in the disposal of applications for land under the waste land sale rules, as it was uncertain what forest land should and what should not be alienated.

678. These difficulties suggested the formation of reserved forests, and accordingly, in their orders of the 16th January 1878, the Government, on the proposal of the Commissioner and the Conservator, decided that all the woodland in Merkunád remaining at the disposal of Government should be reserved. They ordered that it should be exclusively maintained for public purposes and should be forthwith demarcated.

679. In the same order in which the reservation of the woodlands in Merkunád was decided on (G.O., No. 82, dated 16th January 1878), the Government appointed a Forest Commission, consisting of the Commissioner, the local Forest Officer and a Survey Officer, to go over the other divisions of the District, and report what area of woodland should be reserved. The Commission was at once formed and inspected the remaining divisions, reporting on Todanád and Paranginád in August 1878 (G.O., No. 1852, dated the 20th November 1878), and on Kundanád in February 1879 (Board's Proceedings, No. 1364, dated the 21st May 1879).

680. In Todanád, the Commission reported that of a total area of 306 square miles, 159 square miles was on the plateau, while the slopes and the tract between the foot of the slopes and the Moyár river occupied 147 square miles, or 94,000 acres. They stated that the slopes were for the most part precipitous, rocky, and not well wooded, and excepting the margins of rivers, they did not propose to reserve them. They also proposed to abandon the tract along the Moyár river. Accordingly they recommended that out of a total area of 11,700 acres of Government Forest land, 10,800 acres should be reserved.

The Paranginád division they found to be very bare, except on the crest of the hills and on the slopes where a few sholas remained. They stated that the Nád consisted of 91 square miles of plateau and 40 square miles of slopes and proposed the reservation of the whole of the woodlands in this division.

The Commission proposed to delay demarcation and survey of the woodlands, to be reserved in Todanád and Paranginád, until the question of the reservation of the grazing and other communal reserves had been definitely decided, but the Commissioner, Mr. Barlow, recorded his dissent on this point and urged that the forest reserves be marked at once. He added that the question constantly arose, *what is forest*, that the gradations between forest and light forest and scrub were numerous and difficult to be decided, and he urged that fraud could only be stopped, either by demarcating all reserved forests distinctly as soon as possible, or by holding the waste land sale rules in abeyance, which latter course he strongly deprecated.

The Committee also drew attention to the necessity of very largely extending the Government plantations on these hills, and they urged that, however much area might be classed as reserve, the process of denudation would go on as surely as ever; they had seen numerous instances of sholas partially destroyed by fires, and said that this cause of destruction would continue to operate.

The Government, in passing orders on this report (G.O., No. 1852, dated the 20th November 1878), directed that no application for forest or shola land be entertained on the Nílgiris until the whole district had been reported on, and the general question of land reservation, whether forest or grass land, had been considered and future policy decided.

681. In the Kundanád division the Commission found that 12,000 acres out of a total area of 60,800 acres were unoccupied forest. Of this area, they recommended that 4,500 acres, together with the growth on the margins of streams, or about 6,000 acres in all, should be reserved. Into the western part of the division they did not apprehend that plantations could be extended, for the country was too much exposed to the south-west monsoon, and the soil was very poor; but this

portion contained the sources of the Bhaváni river, and it was therefore in their opinion necessary that all the sholas selected by them should be retained. The majority of the Commission considered it even probable that the felling of the sholas not proposed to be reserved would affect the water-supply in the Bhaváni injuriously.

682. On this report the Government passed orders in December 1879 (No. 2247, dated the 5th December 1879) to the effect that the whole existing area should be reserved and protected. And in January 1880 (No. 110, dated 29th January 1880) the Government proceeded to issue final orders regarding the woodlands on the Nílgiris. They said that it had already been decided that in Merkunád all the remaining shola or forest land should be reserved, and that the same course must be followed in Paranginád and Todanád.

Government further directed that the Forest Commission should decide and mark on the maps what is shola or forest, and should reserve it as such.

At a later date, on a reference from the Superintendent, Madras Revenue Survey, the Government said (G.O., No. 1459, dated the 5th November 1880), that though no demarcation on the ground was necessary in the case of sholas, all woodlands throughout the district being reserved, it was still essential that all reserved woods should be indicated on the maps, either by a band or by a wash of color, and also that, when a shola embraced both forest and scrub, the whole should be considered as reserved. In accordance with these orders, the lands supposed to be reserved have been indicated on the maps by a red band. They have also been demarcated on the ground by boundary stones in all tracts surveyed on the scale of 16 inches to the mile, which are included either within village circuits or in areas applied for under the waste land sale rules. Elsewhere the reserves have not been demarcated on the ground.

These reserves include a large area of swamps, though the reservation of swamps was not at the time specifically ordered. In their Proceedings, No. 2594, of the 12th September 1879, the Board of Revenue directed, on the suggestion of Mr. Barlow, the Collector, that a belt of open land, 10 yards wide, should be included in the demarcated land around all reserves.

683. In their Order, No. 2247, of the 5th December 1879, on the reserves in Kundanád, Government said that burning of the grass should be generally prohibited throughout the Kundah division, and the Commissioner was directed to consider what measures should be taken for the protection of the reserved woodlands from fire. Mr. Barlow accordingly, on 14th April 1880, submitted certain rules which were adopted pending the passing of a Forest Act. The scope of these rules was that for the protection of the sholas during the time for firing the grass lands for pasture, the village officers were to be held responsible, and that no firing at all should be allowed in the Upper Kundahs, where the sources of the Bhaváni lie, without the permission of the Commissioner, and that this permission should only be granted to the Todas.

In submitting these rules, the Commissioner gave a graphic account of the damage done by the fires on the hills. He writes as follows :—

"All the small trees on the wind-side of the forest are more or less damaged and the spread of the sholas checked, and, if the wind is high, the fire frequently runs into the forest for some distance. The prevailing wind at the time of the fires is east and north-east, and when the sholas run to a point in this direction, the stumps or stunted trees in a V-shape show how far the fire has run, or, when the side of the shola has met the fire, a horse shoe of stumps or partly-burnt trees evidences the ravages before the fire was killed by the moist vegetation of the shola."

Mr. Barlow adds—"Almost more than the damage done to the large sholas is the hurt to trees fringing streams and to small patches of shola; these are frequently almost destroyed if the fire is fierce and the wind high; patches of withered stumps, or a stream with nothing but stunted trees along it, show this."

Government have recently (G.O., No. 230, dated the 24th February 1882) declined to relax the reservation of woodlands and swamps in favor of applicants for such lands for gold-mining purposes.

In 1877, the Ootacamund Municipality proposed that the downs lying to the west of Ootacamund should be declared "common land," and should be reserved in perpetuity for grazing and recreation purposes. The Government in passing orders on this proposal said that the final decision would be deferred for further consideration, but directed that the Commissioner should entertain no applications for private occupation within the boundaries proposed, without special and preliminary sanction of Government in each case.

684. A modified form of reservation of woodlands exists in the Toda pattas already alluded to. These pattas have been granted to the Todas for land in the immediate vicinity of their settlements (munds), and generally embrace both grass land and shola to the extent supposed to be necessary for the pasture of the mund cattle. The rate of assessment is very low, 2 annas an acre; but the patta contains a stipulation that the land may not be alienated, and that the shola contained in it may not be cut.

If the terms of the patta are violated, the full rate of assessment is charged, or the patta is cancelled. The Todas themselves are not likely to use the land for any other purpose than grazing, but they have hitherto been in the habit of subletting part of their lands for potato cultivation. This practice will be stopped under recent orders; for, if land granted to Todas is let out or alienated to parties other than Todas, prohibitory assessment may be levied on such land at the rate of Rs. 100 per acre of grass land and Rs. 1,000 per acre of shola land. In the recent survey grazing areas, averaging about 50 acres each, have been demarcated as the reserves of about 70 munds. Therefore, except that part of the mund, lands have been sub-let for potato cultivation and to market gardeners, an area of grass and woodland, aggregating some 3,500 acres, has, by this means, been set apart and reserved against clearing.

685. It has been shown in paragraph 658 that the area of land at the disposal of Government on the Nílgiris proper aggregates 311,510 acres. I have not been able to obtain a correct statement of the area of forests reserved under the orders of Government of 1878, 1879, and 1880. That portion of this area which is situated in the tracts surveyed on the small scale has not been demarcated, and its exact area is not known.

Those orders have been a step in the right direction, but they have not settled the business. They have put an end to the wholesale destruction of the sholas on the plateau, and have, to some extent, stopped the alienation of forests which ought to be maintained. But in order to be really useful these orders must be modified and developed much further. As correctly pointed out by Mr. Barlow, it is impossible to maintain any sharp distinction between scrub and forest. The annual fires convert large areas of forest into scrub every year, and after it has thus been converted into scrub, the land which was formerly covered with forest, becomes available for alienation, unless included within the boundaries of a demarcated reserve.

The object towards which we should work must be to select those areas which, on account of the direct or indirect advantages expected, it is desirable should be maintained as forest or be converted into forest on these hills; to arrange for convenient boundary lines which shall facilitate protection, and to mark these boundaries on the ground in a conspicuous and unmistakeable manner.

If these suggestions are accepted, the work of selecting the reserves will, to a great extent, have to be done afresh, but the result will be that Government will have large compact areas at their disposal which can be efficiently protected and economically worked, and eventually, after the demarcation of these reserves has been completed, Government will be able to make available considerable areas of forest land, at present included within reserves, for the extension of cultivation by European settlers and others.

Before discussing the selection and formation of these new reserves, it will be well to consider what has been done, and, to a great extent, been done with signal success, in establishing plantations of Australian trees on these hills.

Plantations.

686. The blue-gum (*Eucalyptus Globulus*) was first introduced on the Nílgiris in 1843. Major-General Morgan, who has kindly given me notes regarding the introduction of the Australian trees on the Nílgiris, informs me that in 1852 he raised a number of plants from the seed produced by a tree at Ootacamund, and that, finding the growth extremely rapid, he obtained a quantity of seed from Australia in 1856, raised about 150,000 seedlings and, after planting out some 70,000, distributed the rest on the hills. In 1857, plants of blue-gum were still so rare that they were sold at the Government gardens at the rate of 12 annas each.

Acacia melanoxylon and *dealbata* were introduced about 1840. In 1857 plants of the former were sold at the Government gardens for 4 annas apiece.

The following dimensions of some of the largest blue-gums at Ootacamund, kindly furnished me by Mr. H. A. Gass, Deputy Conservator of Forests, will show the extremely rapid growth of this tree:—

No.	Locality.	Age.	Girth at 4 Feet.	Total Height.	Remarks.
		YEARS.	FEET. INCHES.	FEET.	
1	Gayton Park	33	14 9½	138	Leader broken by the storm. New leader formed by one of the branches.
2	Woodcock	26	13 8	117	
3	Below Woodstock	20	8 0	102	
4	Woodcot	28	13 9½	109	
5	Do.	28	13 9	115	
6	Do.	28	15 6	112	Girth measured over buttresses; the girth really is only 13 feet 6 inches.

The most rapidly growing forest trees in Europe would not attain this size under 120 years.

Speaking broadly, it may be said that, under favorable circumstances, trees ten years old are 80 feet high with a girth of from 2 to 3 feet, so that up to that age they add 8 feet a year to their total height, while after that age they increase only at the rate of about 2 feet a year, but on the other hand add greatly to their girth.

Acacia melanoxylon has a less rapid growth in height, but seems to continue it during a longer period. Less data are available for this tree, but I am inclined to think that during the first fifteen years, it will be found to grow about four feet in height a year; after that period, it only makes two feet a year.

687. The first Government plantation of Australian trees on the Hills was that near Bleakhouse (generally known as Bandi shola), and it was made in 1856 by Captain Campbell at Wellington. A sum of Rs. 7,500 was placed at his disposal by order of Government dated the 7th February 1856, and of this he spent Rs. 5,460 in the first year in planting six acres with *Acacia melanoxylon*, then called *Acacia robusta*, and 11 acres in the Kota shola with indigenous trees. The planting was orginally done in trenches, and the seedlings were planted 4 feet apart, but subsequently pits 18 inches square were found to answer better and the distance between the trees was increased to 6 feet. The system of sowing the seed in furrows was also tried. In order to secure the safety of the tap roots, the seedlings were planted out from the nurseries into wicker baskets, and, in them, were placed in the pits. In three years Captain Campbell had planted 98 acres with Australian trees and had in the plantation two lakhs of trees from 3 years to 2 months old, and eight thousand ready to plant out. The expenditure up to 31st October 1859 was Rs. 10,072.

688. At Ootacamund, the Collector, Mr. Thomas, began planting in 1857. By Extract from the Minutes of Consultation, dated 26th September of that year, a sum of Rs. 2,500 was placed at his disposal, and, for Rs. 400, he planted 8,000 Acacia and Eucalyptus trees and sowed trees of these species in sholas which had been cleared. In their orders dated 3rd June 1858, the Government, while reviewing Dr. Cleghorn's report on the planting done by Captain Campbell and Mr. Thomas,

sanctioned a sum of Rs. 1,350 for the planting of 10,000 trees for ornament in the neighbourhood of Ootacamund under the superintendence of Mr. McIvor.

Subsequently, other plantations were formed, and in 1869, when the forests and plantations were brought under Jungle Conservancy rules, 191 acres had been planted up.

Planting was continued under Jungle Conservancy, and in 1875 an aggregate planted area of 919 acres was handed to the Forest Department. Since 1875, a few more plantations have been formed and some areas, originally planted with Acacia, have been cut over and replanted with Eucalyptus.

689. The following is an abstract of the plantations existing at the present time :—

No.	Name.	Year when formed.	Area Stocked.	Trees Planted and Remarks.
	Near Ootacamund.		ACRES.	
1	Arnakal	1873	8	Eucalyptus.
2	Governor's Shola	1863 to 1872	55	Eucalyptus and Acacia. A portion cut from 1878 to 1881.
3	Hoopatti	1873	12	Eucalyptus.
4	Andy	1873	60	Eucalyptus and Acacia.
5	Sheffield	1862	23	Acacia dealbata with a few Eucalyptus. Cuttings from 1877 to 1879.
6	Cally	1870	17	Acacia dealbata with a few Eucalyptus. Cut in 1880-81.
7	Chougat Cally	1871	26	Eucalyptus.
8	Baikie	1874	33	Do.
9	Madana	1863	8	Acacia melanoxylon. Cut 1877 to 1880.
10	Chemengoolie	1879	33	Eucalyptus.
11	Muttinad	1880-81	80	Do.
12	Brooklands	1862	10	Acacia dealbata and Eucalyptus.
13	Aramby	1863-65-81	58	Eucalyptus.
14	Koolie	1875-76	58	Do.
15	Marlimund	1860	11	Acacia (cut) and groups of Eucalyptus.
16	Norwood	1872-73	26	Eucalyptus.
17	Snowdon	1860	7	Acacia dealbata.
18	Bathri	1877-78	60	Eucalyptus.
19	Deva Shola	1880	14	Do.
	Near Coonoor.			
20	Blackbridge	1874	48	Eucalyptus.
21	Rock	1875	8	Do.
22	Bleakhouse and Bandi Shola	1857	285	Acacia melanoxylon and dealbata. Cuttings 1877 to 1881.
23	Old Forest	1872-73	200	Eucalyptus. Cuttings 1878 to 1881.
24	Tippakutchi	1875	35	Eucalyptus.
25	Rallia	1872	60	Alternate belts of Eucalyptus and Acacia melanoxylon.
26	Little Rallia	1877	10	Eucalyptus.
27	Newman	1870-71	35	Eucalyptus, thinnings 1877 to 1881.
	Total Area Stocked ..	..	1,230	

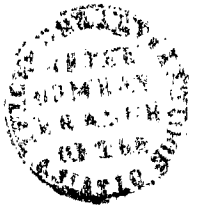
690. The great majority of these plantations have been very successful, but there are some remarkable failures. Nearly all plantations were made in old forest land and generally in places where the wood had been cut and sold for fuel and plantations raised in such places have generally succeeded and are well stocked. These plantations now present a complete gradation of ages from a dense mass of poles, 800 to 1,000 on the acre, 5 years old, and from 40 to 50 feet high, to a forest of young trees, 20 years old, 500 to the acre, and 90 to 100 feet high.

Timber Production of Australian Trees.

691. As soon as I had visited the principal plantations, I submitted (on the 19th May) to the Government of Madras the expediency of taking steps to determine accurately the rate of growth and timber production per acre. I added that it would doubtless be found necessary considerably to extend these plantations on the plateau, and that, for this purpose, it would be well to have reliable data on which to estimate the outturn of thinnings and the final crop per acre at different ages.

I suggested that the Mysore Government should be requested to lend the services of Mr. D. E. Hutchins, Assistant Conservator of Forests, for this purpose as a temporary measure, and on the 14th June, the Government of Madras accepted my proposal. Mr. Hutchins was employed on this duty from the 15th June to the end of September, and he has been good enough to furnish me with the chief results of his enquiries, embodied in a report which he has submitted to the Conservator of Forests.

692. The following statement contains an abstract of some of the more important data. His work extended to ten plantations at elevations between 6,000 and 7,500 feet. Two (Brooklands and Marlimund) are here omitted, as the figures, without the explanations given in Mr. Hutchins' report, would not be correctly understood. Of the others, six are of pure *Eucalyptus Globulus* from 5 to 19 years old. One, Rallia, consists of alternate bands of Eucalyptus and *Acacia melanoxylon*, while Bleakhouse is stocked with Acacia partly *melanoxylon*, partly *dealbata*. Mr. Hutchins examined also a quarter acre of wattle coppice, 4 years old, and determined the mean annual increment per acre at 3 tons. For converting cubic feet into tons of dry wood, the weight of a cubic foot of dry wood (including bark) was taken at 40 lbs. in the case of blue-gum, and at 35 lbs. in the case of *Acacia melanoxylon*. On this point further enquiries will perhaps necessitate a correction, which however will not materially affect the main results. I am disposed to think that at the age at which the plantations were examined, there is no great difference in the weight of the wood of the two species, the blue-gum and the *Acacia melanoxylon*:—



Plantations.	Area of plantations in acres.	Age of sample area in years.	Elevation above sea level in feet.	Area of sample area in acres.	Number of trees per acre now on the ground.	Reducing factor used.	Actual stock now on the ground per acre. Cubic feet.	Yearly acre-increment (calculated) Tons of dry wood.	Details of Acre-increment.			Remarks.
									Standing stock.	Blanks in canopy.	Previous thinnings.	
Eucalyptus Globulus or Blue-gum.												
Bathri	60	5	7,235	1·708	847	0·4717	2,966	13·067	10·593	2·474	..	
Blackbridge ..	48	6	5,954	1·000	980	0·47	2,151	6·682	6·395	* 0·287	..	* Approximate, the planting being irregular and the cover not properly established.
Old Forest	200	9	6,694	1·057	1,045	0·457	5,963	11·993	11·832	0·161	..	
Norwood	26	10	7,550	1·221	416	0·447	6,829	13·434	12·196	† 0·263	0·975	† From nine blanks.
Rallia..	60	10	7,215	‡ 0·269	523	0·45	6,960	12·428	12·428	..	..	‡ This is the area of two bands of *Eucalyptus Globulus*.
Newman	35	12	7,185	0·932	1,324	0·455	6,792	11·039	10·107	0·015	§ 0·917	§ The thinning was estimated by counting the stumps which are quite recent.
Aramby	58	19	7,460	1·406	499	0·4503	9,031	12·063	8·488	..	‖ 3·575	‖ This is an approximate estimate.
Acacia melanoxylon or Australian Blackwood.												
Rallia..	60	10	7,215	0·5493	592	0·547	3,845	5·8588	5·858	..	..	¶ The acre-increment is deficient by the amount of previous thinnings which cannot be estimated.
Bleakhouse	235	26	6,384	1·778	163	0·5357	7,336	¶ 5·751	4·408	1·343	Unknown.	

693. Leaving the discussion of these results to Mr. Hutchins' report, I limit myself to the question of the average annual yield per acre that can reasonably be anticipated from plantations established on a large scale on the plateau.

Mr. Hutchins, at my suggestion, selected his sample areas in places completely stocked, and, in calculating the full acre-increments, made allowance for blanks and previous thinnings. His results, therefore, give the highest mean annual increment per acre, in each plantation, at the age which the sample area had attained. It will be seen that the annual timber production per acre up to the age of 19 years in the case of blue-gums and 26 years in the case of Acacia varies within narrow limits; for blue-gum, the limits are 11 and 13·4 tons, or 616 to 750 cubic feet solid wood per acre, in plantations 5 to 19 years old. There is one exception, viz., Blackbridge, which has an annual increment of only 6·7 tons, or 375 cubic feet per acre, due partly to less successful planting, partly to unfavorable soil and partly perhaps to the low elevation.

In the case of *Acacia melanoxylon* the total annual increment per acre is 5·9 tons in a plantation 10 years old and 5·8 tons in one 26 years old, say 376 cubic feet on an average.

694. These figures may be regarded as the maximum annual increments per acre up to the ages mentioned, and I may here mention that they far exceed the yield of the most productive natural forests or plantations in Europe.

Thus the mean annual yield of different descriptions of forest in Germany on the very best soil and under the most favorable conditions, expressed in English cubic feet per acre, may be put down as follows:—

Oak, high forest, under a rotation of 90 to 120 years—80 cubic feet per acre.
Oak, coppice, under a rotation of 15 to 25 years—57 „
Silver Fir, high forest, under a rotation of 80 to 110 years—148 „

These however are very high rates of yield. Average rates are much lower.

No data are as yet available to justify conclusions as to whether a still higher mean annual yield will be obtained, as the plantations grow older. Periodical examinations of these plantations must be made every 5 or 10 years in order to determine this point, and upon the results obtained by these periodical surveys must depend the plan of working them and the age at which they should be cut.

Probable yield of Plantations on a large Scale.

695. The yield of these plantations on a large scale will, to a great extent, depend upon the method of reproduction adopted. In this respect the blue-gum has the great advantage that it reproduces admirably from coppice, provided the young growth is protected; and it is not impossible that on this account it will be most advantageous to manage blue-gum plantations on a short rotation. Assuming that this was done and that the plantation was cut down as coppice when ten years old, there is no reason why the most successful portions on good land should not have an annual yield of twelve tons an acre.

But this could only be expected to apply to land which was formerly stocked with forest and to positions where the trees are sheltered against wind. Blue-gum has been planted on grass land, but its growth on such land is slow. Plantations exposed to the full force of the south-west monsoon, such as Chemengoolie, on the road to Pykara, are very unsatisfactory, and in some plantations which have succeeded well, such as Arnakal and Governor's Shola, the rate of growth is much retarded by an unusually severe monsoon, such as that of last year. In these plantations the tops of the trees have been quite stript of their leaves and look dry and red. Elsewhere, as at Andy, attempts made to plant large areas have failed, though I do not wish to imply that by more efficient protection and better management these failures might not have been avoided, but they show that a yield like that of Mr. Hutchins' sample areas must not be reckoned upon for plantations made on a large scale.

696. High winds have hitherto proved to be the chief enemy of blue-gum plantations on the Nílgiris, but borers (probably the larva of a beetle) have made their appearance and have done some injury at Bathri, a plantation five years old. The damage done to the Acacia by several species of Loranthus, which multiply

to such an extent as to kill the trees, has been noticed by Colonel Beddome in several of his inspection reports. Many trees in Bandi shola have been killed by these parasites.

If blue-gum plantations are managed as coppice, a most important point to attend to will be to protect the young growth against cattle. Both in Governor's Shola and in Cally, where considerable areas had been cut over, I found a large proportion of the shoots trodden down by cattle, and it is a remarkable character of the blue-gum that, though the shoots are not eaten by cattle, yet once trodden down the stump dies and no fresh shoots spring up. Thus in the two plantations mentioned, through want of protection a large proportion of the stumps have died, and reproduction is incomplete. The blue-gum flowers and ripens seed on the Nílgiris; self-sown seedlings are found in gardens and in fields with tea, where the ground has been kept loose and open, and I have no doubt that eventually, under proper treatment, natural reproduction from seed may be possible; but in or near the Government plantations I have not found any reproduction from self-sown seed.

These remarks will suffice to explain that taking together good and bad seasons, localities favorable and unfavorable, the mean annual yield of blue-gum plantations made on a large scale cannot be estimated at more than, say, six tons per acre.

697. *Acacia melanoxylon* reproduces imperfectly from coppice, though it throws up root-shoots abundantly. Reproduction from root-suckers may perhaps be utilized, as has lately been done in the case of sissoo in the Punjab, but ordinary coppicing does not answer. The trees produce seed abundantly on the Nílgiris, but instances of reproduction from self-sown seed, such as is noticed in the case of *Callitris (Frenela) rhomboidea* are not common. The wattle (*Acacia dealbata*) coppices freely and sends up numerous root-suckers. The result is an exceedingly dense thicket of thin sticks which will probably require a system of steady and judicious thinning in order to produce a large yield per acre. The wattle flowers abundantly, but ripens its seed sparingly.

Both the large Acacia and the wattle stand exposure to storms better than the blue-gum; they grow well in grass land, and the wattle spreads rapidly by means of its numerous root-suckers, wherever fire and cattle are excluded. Sufficient data are not available to form an estimate of the probable annual yield of these two species if planted on a large scale, but so much seems certain that it is not likely to exceed half the yield of the blue-gum.

698. Sufficient experience has not yet been gained to say whether the timber of these three species grown on the Nílgiris will be valuable. Other species of Eucalyptus thrive well, but nothing can at present be said regarding their usefulness and rate of growth.

The three principal species named will probably chiefly be used as fuel, and it is now for consideration whether there is likely to be so large a demand for fuel as to justify any considerable extension of these plantations; and, secondly, whether, for other reasons, the formation of large reserved forests on the plateau of the Nílgiris is desirable.

699. The plantations as they stand at present are scattered in 27 plots, the smallest being entered as seven and the largest as 235 acres in the returns. Protection and management of such small plots is exceedingly difficult, and, as a matter of fact, protection has not been efficient. The protection against fire of these plots is easy. Nothing is required, but a narrow trace 2 or 3 feet wide from which the grass is removed. Yet in April last fire entered the Rallia plantation and did much damage. If these plantations are to be maintained, they must be included in a limited number of compact blocks, with convenient boundary lines, sufficiently large to make it worth while to place a forest guard in charge of each, who must reside in the same or in its immediate vicinity.

Indirect Advantages of Forests on the Plateau.

700. The question is, are these large reserves required, and if formed should they be planted up.

I am of opinion that the fertility of the plateau might be greatly increased if the higher ridges were all covered with forest. That it is possible to cover high and exposed ridges with blue-gum is shown by the instance of the Old Forest, a most successful blue-gum plantation on the crest of the hill, north-east of Coonoor, now a conspicuous landmark, visible on a large portion of the plateau. What the effect of covering the high ridges on the plateau with such forest would be I do not venture to predict. That the effect would be beneficial, there can be no doubt. Such belts of forest would afford shelter against winds and storms, and they would probably ensure a more plentiful and more even supply of water during the dry season. It has been maintained that forests of Eucalyptus diminish the water-supply to springs and streams instead of preserving it. In a note of the 12th October 1880, printed with G.O., No. 1394, dated the 25th October, the Duke of Buckingham and Chandos, the then Governor of Madras, expressed a doubt whether blue-gum is the right tree to plant for the maintenance and protection of water-sources. His Grace added : "The enquiries I have made, since I have been on the hills, lead me to think that the enormous growth of this tree on the hills absorbs the water and tends to dry up, rather than to maintain the supply.

Upon this the Conservator, having been requested by Government to give his careful consideration to the utility of blue-gum plantations, as regards the preservation of the water-supply, reported as follows :—

"We have not sufficient data to say positively whether the rapid growth of these Eucalypti tends to absorb more subsoil moisture than the indigenous trees, but the theory that this is the case is probably correct."

In passing orders on this communication, on 6th January 1881, Government requested the Conservator to institute careful enquiries as to the effect of blue-gum plantations in deteriorating water-sources, and directed that, until sufficient data had been collected, these trees should not be planted in the close proximity of springs.

In November 1881, Mr. N. A. Roupell, Acting Commissioner of the Nílgiris, in forwarding the Conservator's inspection report to the Government, said :—

"Whether, looking to the water-supply, the Eucalyptus is the best tree to plant seems very questionable. The ground beneath it is commonly bare and dry. It has a long tap root and its capacity for absorbing moisture seems so great as to convert swampy malarious ground into dry and healthy sites."

701. That a tree which, as in the Norwood plantation, behind Government House at Ootacamund, produces during the first ten years of its life 13·4 tons of timber per acre annually, or on an average at the rate of 82 lbs. of wood and bark a day, must draw from the ground and pass through its leaves enormous quantities of water, is certain, and there is no doubt that the ground in a forest of this tree is generally more dry than under the more slowly-growing trees, which compose the sholas.

But it is not correct to say that the ground under the blue-gum is bare. On the contrary, wherever protected against fire and not overrun with cattle, the ground gets covered in a few years with a dense underwood, consisting, in the case of those planted on grass land, of *Dodonæa viscosa* and brambles, which are mixed with the shoots of the shola trees, in plantations made in old forest land. The decaying leaves, branches, and rootlets of the underwood, together with those of the blue-gum, form a dense layer of vegetable matter, which doubtless arrests surface drainage. The ground remains naked only in the vicinity of Ootacamund or other settlements, where the plantation is exposed to jungle fires and is overrun by cattle.

The effect of Blue-gum upon the Water-supply must be determined by actual Experiment.

702. The question, what effect forests of blue-gum or other very rapidly growing trees exercise upon the disposal by evaporation, surface and under-ground drainage, of the rain-water which falls upon the ground, requires systematic study and should be taken up in connection with the experiments, recommended in another part of this report to be instituted, in order to determine the influence of forests upon the water-supply in streams. In this case the experiment will simply consist in this ; to plant up gradually with blue-gum the catchment areas of two or three

streams and to measure the discharge of these streams as well as the rain which falls upon the catchment area. In this case it will be necessary to make accurate maps of these catchment areas, showing the blocks and compartments into which they must be divided, and the limits of existing sholas, scrub, swamp, plantation, rock and grass land, so that their area may be determined. Planting operations should commence in one of these selected areas only, and the others should remain in *statu quo*, being only protected against cutting and fires. The other areas would then show the gradual effect of simple protection. In the area selected for planting, operations should at first be confined to grass lands and should gradually be extended to scrub; and finally, the shola forest should be replaced by *Eucalyptus*. The results of the discharge measurements of successive years, compared with the total rainfall which falls upon the area during the same periods, will indicate modifications to be introduced in the plan of operations here sketched.

703. On my frequent visits to these plantations during last season, I was forcibly struck by the very good appearance of those fields which were in the immediate vicinity of these plantations, and it appeared to me that the land was more uniformly moist and that the shelter against winds was beneficial to the crops. That the effect of continuous belts of forest, on the higher ridges of the plateau, will be beneficial, I have no doubt; in what manner, and to what extent the benefit will be felt, must be determined by experience and experiments.

Probable demand for the Wood produced on the Plantations.

704. In paragraph 30 of his inspection report, dated the 21st June 1881, embodied in G.O., No. 310, dated the 15th March 1882, of the Nílgiri plantations, Colonel Beddome states that there is no demand whatever for the large supply which might be cut for firewood, and that unless a railway is made up to the plateau, there is no chance of there ever being a demand for the vast quantity of building timber which is growing up. He added that, in the absence of the railway, he could not see any chance of the plantations ever paying, and therefore did not recommend extension. In the same paragraph, he drew attention to the fact that Ootacamund, as well as Coonoor and Wellington, were becoming completely overgrown with *Eucalyptus* and *Acacia*; that these trees grew so fast that most premises could supply their own wants; and that the large private plantations about Ootacamund must be nearly sufficient to supply all the market.

705. From what I was able to learn, I conclude that, under present conditions, there is a sufficient demand for the produce of the existing Government and private plantations, and this is proved by the high rates at which wood and charcoal are sold. But I admit that if the reserves, the formation of which is now proposed, are to be planted up, the prices will fall and the local demand will be insufficient.

This will change if a railway is built; for not only will that portion of the line which is on the hills consume the wood produced on the plantations, but if it can be produced at a sufficiently low rate, wood grown on the hills may also be consumed by the railway below, possibly as far as Salem. Assuming that the plantations on the plateau were expected to supply fuel for 150 miles of line, or say 15,000 tons of wood a year, this would, at an annual yield of 6 tons per acre, require an area stocked with blue-gum of 2,500 acres. Adding an equal area for local consumption which would increase if the railway were built, I am disposed to think that the planting of not more than 5,000 acres on Government account should at present be contemplated, including the 1,230 acres already stocked.

706. This figure must not be accepted as a definite estimate, but more as an illustration of what is intended. The extent to which plantations should be made by Government on the Nílgiris must depend upon circusmtances which cannot be foreseen. Thus it is possible, though not likely, that charcoal can be produced in these plantations at so low a rate as to be used for iron-smelting, either from the ore found on the Nílgiris, or to make finished iron and steel from cast-iron made in the Salem District. But, as said before, it is not likely that charcoal can be produced from blue-gum at a sufficiently low rate. And it has not yet been proved that the charcoal of blue-gum is good for iron-smelting.

Cost of Plantations.

707. Regarding the cost of the existing plantations, complete data are not available, and it would be waste of time to discuss the incomplete data recorded in inspection reports and other documents. Mr. H. A. Gass, the Acting District Forest Officer, has kindly prepared for me the following estimate of the cost of planting an acre on shola land and on grass land. The items stated are believed to include all working charges, until the plantation is ten years old, when it may be cut, if so short a rotation should be decided upon.

Cost of Planting one Acre of Shola Land 6′ by 6′ = 1,210 Plants per Acre.

First Year.

	Rs.	A.	P.	Rs.	A.	P.
Cost of clearing, burning brushwood, &c.	4	0	0			
,, forming nursery, cost of seed, sowing, &c. ...	3	0	0			
,, lining and marking pits	1	0	0			
,, pitting	15	0	0			
,, filling	2	8	0			
,, planting	2	8	0			
,, weeding twice	7	0	0			
,, turning soil, replacing casualties	1	8	0			
,, protection from frost and fire	2	0	0			
,, watcher	2	8	0			
Total expenditure for first year				41	0	0

Subsequent Years.

Second year—Cost of weeding twice	7	0	0			
Third year—Cost of weeding twice	7	0	0			
Second to ninth year—Cost of watcher and fire-tracing for nine years, at Rs. 1-8-0 a year	13	8	0			
Expenditure from second to ninth years				27	8	0
Total ...				68	8	0

Against this must be placed the amount realized by the sale of the wood cut in clearing the shola, which varies so much, according to position and other circumstances, that no reliable estimate can be framed. On the other hand, interest and a rate for establishments and general charges should be added. Regarding this point also no definite estimate can be framed. For planting on grass land the charges are less, but there are no receipts, on account of the wood cut, to set against the outlay.

Cost of Planting one Acre of Grass Land 6′ by 6′ = 1,210 Plants per Acre.

	Rs.	A.	P.	Rs.	A.	P.
Cost of forming nursery, cost of seed, sowing, &c. ...	3	0	0			
,, lining and marking pits	1	0	0			
,, pitting	15	0	0			
,, filling	2	8	0			
,, planting	2	8	0			
,, protection from frost and fire	4	0	0			
,, turning soil, replacing casualties	2	0	0			
,, watcher	2	8	0			
Total expenditure during the first year				32	8	0
Cost of watchers and fire-tracing for nine years, at Rs. 1-8-0 a year				13	8	0
Total ...				46	0	0

These figures do not justify a complete estimate of the cost of these plantations, including general charges and interest, until the crop can be cut; but so much may be affirmed that under existing circumstances the total cost, including interest, up to the time when the plantation is ten years old, cannot be less than Rs. 100 an acre and will probably be much more. I shall not attempt to estimate

what it will cost to produce a ton of wood or a ton of charcoal in the blue-gum plantations of the Nílgiris.

708. Formerly the area planted annually fluctuated from year to year. I recommend that in future a certain area a year, say 100 acres, be planted, and that the same extent be planted each year during a series of years to come. Assuming that it is intended altogether to plant (5,000 less 1,200) = 3,800 acres, this plan would give employment during thirty-eight years. The advantage of planting the same area annually is that, with a steady demand for labor, there is better chance of reducing the cost of the work than if the demand fluctuates. In this manner, the working charges, which I will assume will at first amount to Rs. 6,000 a-year, may perhaps gradually be reduced to, say, one-half of this amount. Hereafter, the area planted annually may, according to circumstances, be reduced or extended. Apart from special considerations, the areas to be planted up should be selected in the localities most favorable for the growth and the disposal of the wood, and I would further urge that the easiest localities, and those where success is most likely to be attained, be taken in hand first. It must be remembered that success is an excellent teacher, while very little can be learnt from failures.

In the preceding remarks, the only trees suggested for these plantations are blue-gum and Acacia. But it does not at all follow that there are no others equally suitable. The indigenous shola trees are probably out of the question on account of their slow growth. But there are other exotic trees which grow very rapidly on the Nílgiris. I desire to draw attention particularly to the following :—

(1) *Cupressus torulosa*, Don., indigenous in the Himalaya at elevations between 6,000 and 8,000 feet, ripens seed abundantly, grows very rapidly at Ootacamund, and self-sown seedlings are common; would probably produce excellent planking on the Nílgiris. The species commonly called *Cupressus macrocapa* at Ootacamund grows remarkably well. It is a tree of California, where it is known to be a very rapid grower. It may perhaps be found useful as a shelter tree in the plantations.

(2) *Frenela* (*Callitris*) *rhomboidea*, Endl., with clustered cones; a small tree from Australia, common at Ootacamund, where it spreads rapidly from self-sown seedlings.

(3) *Pinus insignis*, Dougl. (commonly called *P. tuberculata* at Ootacamund), California; grows with extreme rapidity, more rapidly than blue-gum, and has the excellent quality that the side branches cover themselves with dense masses of young branchlets. A tree at the Government gardens bears male catkins and a few cones, but has not yet ripened seed. As soon as this tree produces seed on the Nílgiris, its cultivation, on a large scale, should be attempted. The dense, well furnished foliage would gradually enable it to resist storms and wind, and, when plantations are made on a large scale, this species also may be found useful to afford shelter to the young Eucalyptus.

Cryptomeria japonica, Don., one of the chief trees of Japan, grows well at Ootacamund, though not with great rapidity. The timber is esteemed in Japan, and it should have a trial in the plantations on the Nílgiris. Of Himalayan trees, none save the cypress seem to thrive sufficiently well to merit a trial on a large scale; *Pinus excelsa* does not flourish, nor does the deodar; *Pinus longifolia* grows fairly well. Of European trees, the oak, *Quercus pedunculata*, is common at Ootacamund, reversing the seasons. It is leafless for a month or two during the rains, and the fresh flush of leaves generally comes out in autumn. Its growth on the hills is too slow for cultivation on a large scale. What is called *Pinus maritima* (*Pinus Pinaster*) is common at Ootacamund, but has more the appearance of *Pinus Laricio*; it is a slow grower on the Nílgiris. *Pinus halepensis* lives, but does not thrive.

When plantations commence to be formed on a systematic plan, and on a large scale, it will be most desirable to mix the blue-gum and the *Acacia* with trees of a different kind, and some of the coniferous trees here mentioned may prove

useful. A mixture of species is the best safeguard against the spread of insects and fungus, which might otherwise do great damage.

Formation of New Reserves.

709. It now remains to indicate where the reserves should be formed on the plateau. As a commencement I recommend that certain tracts be taken in hand, including the existing plantations in the vicinity of Coonoor, Wellington and Ootacamund, and near the probable line of the railway.

A. Reserves proposed near Wellington and Coonoor.

(1) *Blackbridge*—comprising so much of the land between the new road from Wellington to Kótagiri and Bleakhouse as is at the disposal of Government. Will include Rock and Blackbridge plantations measuring 56 acres. The total area here available is estimated at 300 acres.

(2) *Old Forest*—will comprise the old forest plantation, as well as a piece of Government land extending from Sim's Park to Bleakhouse, along the high level supply-channel and the road leading from Coonoor to Bleakhouse. Area estimated to be 492 acres. This, like block (1), is situated in the Coonoor settlement.

(3) *Bleakhouse and Bandi Shola.*—There are three isolated blocks planted up with *Acacia melanoxylon* and *dealbata*, which, it is feared, cannot be united. There is some uncertainty regarding their area which, in the return of plantations received from the local Forest Office, is stated as 235 acres, while from the maps the three blocks would appear to aggregate only 140 acres. The area is situated partly in the Coonoor settlement, partly in Yedapalli village.

(4) *Halikeri Block.*—This block will include all available Government land, whether already reserved or not, situated on the south side of the St. Catherine Falls Valley on the plateau, and will comprise the Teppakutchi Blue-gum plantation, as well as the St. Catherine Falls Shola. The area is estimated to be between 400 and 500 acres.

B. Reserves proposed near Ootacamund and between Ootacamund and Kótagiri.

(5) *Rallia.*—This block is intended to comprise all Government land, whether reserved or not, on the high ridge which extends from Dodabetta to the neck, where the road from Ootacamund joins that from Coonoor to Kótagiri. It will include the plantations of Rallia, Little Rallia, and Newman. It will also comprise the eastern slopes of Dodabetta, and a high rocky ridge entered as Kerebetta on the Nílgiri District map. For a considerable distance the road from Ootacamund to Kótagiri will form the northern boundary. There will probably be a few enclosures of private land, viz., the Toda settlement, called Bettamand, and a few patta lands of villages Menali, Jakkatalla and Honathalli. The area is estimated at 3,000 acres.

(6) *Nanjanád.*—This reserve will comprise the following plantations:—Governor's shola, Arnakal, Andy, Sheffield, Cally, Chaugat Cally, Baikie and Madana. Its western limit will be near the Krurmund river, and it will extend from the northern boundary of Governor's shola and Chaugat Cally, to the lands of Nanjanád village. The total area is estimated at 3,600 acres, and the greater part will be situated in Todanád, with a small corner in the Ootacamund settlement.

(7) *Aramby.*—It is most desirable to unite the two plantations of Aramby and Koolie into one block by taking in the intervening grass land. The block should be formed into a compact shape by including as much

of the surrounding Government land as may be necessary. It is hoped that, in this manner, a block of 600 acres may be obtained. It will all be situated within the boundaries of the Ootacamund settlement.

(8) *Bathrie.*—This block should comprise the Bathrie plantation and as much of the land lying in the fork between the Lovedale and Fairlawn valleys, as may be at the disposal of Government. The area is estimated at 500 acres.

The three small plantations of Marlimund (11 acres), Norwood (26 acres), Snowdon (7 acres) must remain as isolated blocks. Though they are close to each other, there seems no prospect of being able to unite them into one block.

The probable areas of these eight blocks are as follows :—

	ACRES.
1. Blackbridge	300
2. Old Forest	492
3. Bleakhouse	140
4. Halikeri	450
5. Rallia	3,000
6. Nanjanád	3,600
7. Aramby	600
8. Bathrie	500
Total ...	9,082

710. These are the areas which should be taken up as a commencement, and after these have been settled, I recommend that the following projects be taken into consideration :—

A number of reserves in Merkunád, south-west of the Kartairy falls and one to include the Government portion of Deva shola with the land to the north of it.

The high hill, marked Chinna Dodabetta on the map, between the Belbeck plantation and the Lawrence Asylum, may also with advantage be taken up and planted.

A reserve in Todanád, between the Pykara river and the old road from Ootacamund to Pykara including the Chemengoolie plantation, and another near the Sígúr road to include Brooklands and Muttenad.

711. It should further be considered whether some of the bare ridges, which run from Snowdon and Dodabetta, in a north-easterly direction, and which separate the fertile valleys with large Badaga villages in that portion of the plateau, should not be demarcated, protected and eventually planted up. In order to accomplish this, some of the Badaga holdings on the slopes of these ridges, which are cultivated from time to time with long fallows between, must be taken up, but it will not be a matter for regret if these poor and unproductive fields are replaced by well-stocked forest, the vicinity of which will greatly improve the fertility of the fields in the valleys below. At the outset I recommend that one only of these bare ridges be taken up and planted, but I feel assured that the success which will attend this undertaking will make the Badagas desire to have all bare ridges between the valleys, occupied by their fields, planted up.

In pursuance of this plan I hope that the high ridge, marked Rallia on the map, which overhangs the road from Coonoor to Kótagiri, with the spurs branching off from it, may be placed under protection. These projects to form forests on the bare ridges in the midst of the Badaga lands must be dealt with boldly, as soon as the success of the scheme has been proved in one or two instances. There will at first be opposition, but in the end the Badagas themselves will, I feel assured, be pleased with the arrangement. These ridges are at present chiefly used as pasture land and the grass under both the blue-gum and Acacia is poor. But there will always be open glades between blocks of forest, and on these there will be an abundant supply of grass. The local Forest Officer should devote special attention to the question of arranging these plantations so as to produce in them as much cattle

fodder as possible. It is by no means impossible that excellent grass can be produced on glades and blanks in these plantations, and that fodder trees, such as *Celtis australis*, can be grown either on the edge of these plantations or mixed with the blue-gum and Acacia.

712. The suggestions here submitted will, if accepted, in no way interfere with the downs west of Ootacamund, which it has been proposed to set apart as grazing and hunting ground. The boundaries of this land are stated, in the Proceedings of the Municipal Commission of the 25th October 1877, to be "Sígúr road to Sandynalla, Briar shola, Governor's shola, and Fairlawn." The Nanjanád or Governor's shola reserve will touch it and will perhaps enclose a small corner of the recreation ground. But even this can be obviated, if necessary.

713. The outlines of the projects here submitted were urged by me upon the local officers from the commencement of my stay on the hills, and on the 22nd June 1882, Mr. R. S. Benson, the Special Assistant Collector in charge of the settlement, requested authority to reserve patches of Government waste land lying between or adjacent to existing Government plantations and reserved sholas, and to reserve grass land along prominent ridges with a view to their being eventually planted up.

As regards the first point, the Board of Revenue had already, in their orders of the 10th January 1881, said that in the nads other than Merkunád, where demarcation had been completed, such waste lands might be added as would square the boundaries and provide space for planting up and extending the forests. Both proposals received the sanction of Government on the 8th August 1882, and the point having been settled that grass lands may be included in areas to be reserved, no time should now be lost in selecting the blocks which should be constituted reserved forests under the Act.

714. When all the areas, which it seems expedient to select, have been constituted reserved forests under the Act, then the question may be considered what land, not included within the reserves, may be disposed of to planters. As already adverted to, it is an essential part of the present proposals that, while securing the formation of a sufficient area of reserved forest on the plateau, they give at the same time every facility for the establishment of European settlers on the hills. The orders of 1879, which directed the reservation of all sholas on the hills, were a move in the right direction, and their effect has been most beneficial; for the preservation of a large area of sholas is entirely due to the issue of those orders. At the same time it would be desirable to have forests, in many places, on the crests and spurs of hills where there are no sholas at present, and, on the other hand, isolated sholas might in many cases with advantage be sold to planters. This refers particularly to those sholas which form enclosures in private estates and the existence of which is a source of great inconvenience to planters. The aim of my proposals here, as in other cases, is to pave the way for a sharp separation between forests, grazing grounds, fields, and estates managed by European settlers. There is room enough on these hills for a large expansion of cultivation of all kinds, but matters must be so arranged as to place each class of land under such conditions as will contribute most to the prosperity of the country. As regards forests, there can be no doubt that they will be most useful if they occupy the crests and higher slopes of the hills, and that they can best be managed if they consist of large sized blocks of compact shape. The object should be, in the place of the innumerable small patches of shola which are nominally reserved under existing orders, to constitute a limited number of large reserves of compact shape, which can be efficiently protected without undue expense, and in which it is intended eventually to plant up all grass lands and scrub.

715. It has been shown above that the total area at the disposal of Government in the Nílgiris proper is 311,510 acres. Of this area it is proposed in the first instance only to make 9,000 acres reserved forests under the Act. This is on the plateau, and in addition to this, large areas on the slopes must be maintained as forest. But making allowance for all this, a very large area will remain for the establishment of private plantations and other cultivation, and every effort should

be made to make available as large an area for these purposes as the general interests of the country may permit. But I venture to urge that when land is sold under the waste land sale rules, the full market value of such land should be paid to Government, and that the assessment should not be fixed at too low a rate. This will tend more than anything else to prevent land-jobbing; it will guard against land being locked up, and it will compel proprietors to cultivate their land intensively and to use it fully.

CHAPTER XIV.

GODAVARI.

716. The taluks of Bhadráchalam and Rékapalle were ceded by the Nizam to the British Government in 1860, and up to 1874 they belonged to the Godávari District of the Central Provinces. In 1874 they were incorporated with the Godávari District of the Madras Presidency.

717. While these taluks were part of the Central Provinces, the settlement was introduced, and it may be assumed that under this settlement here as in other districts of the Central Provinces, a certain portion of the Government waste lands (excess waste) was set apart as absolutely at the disposal of the State. A large portion of the land in these two taluks is Zemindari. Colonel Beddome, in his report of the 27th October 1877, states the distribution of the land as follows :—

	Bhadráchalam. SQ. MILES.	Rékapalle. SQ. MILES.
Government forest	100	420
Zemindari forest	50	120
Cultivation	60	80
Total ...	210	620

Possibly the area entered as "Government forest" by Colonel Beddome is the "excess waste" which at settlement was declared to be at the disposal of Government. The following data, regarding the area of the two taluks, have lately been received from the Board of Revenue :—

	ACRES.	SQ. MILES.
Bhadráchalam taluk	136,960	214
Rékapalle taluk	446,080	697
Total ...	583,040	911

	ACRES.
Zemindari and Inam land	102,328
Government land	480,712
Total ...	583,040

The population is exceedingly scanty. According to the District Manual the estimate in 1871 was—

	SOULS.
Bhadráchalam	22,837
Rékapalle	8,896
Total ...	31,733

The abstract of the Census of 1882 gives the population of the Godávari Agency tracts as 10,899. Whatever figures may be correct, the population is not more than 35 souls to the square mile.

718. Excepting narrow belts of evergreen trees at the bottom of valleys and ravines, the forest is all deciduous, with teak, *Diospyros Melanoxylon* (ebony); *Terminalia tomentosa, Arjuna; Pterocarpus Marsupium; Dalbergia latifolia and Hardwickia binata* in places.

It is the unanimous opinion of Forest and Civil Officers that grazing, fires during the dry season, indiscriminate cutting, and *pôdu* cultivation have ruined and are ruining the forests, though the population is exceedingly scanty. It, however, also appears that the forests are not hopeless, for Mr. Boileau mentions large quantities of teak saplings, and it is clear from his reports that some valuable forest tracts are left.

719. That the forests are capable of producing marketable timber appears from the revenue which they have yielded. The following statement shows the revenue and expenditure on account of the forests in these two taluks, since they have been under the Government of Madras:—

Years.	Receipts.	Charges.			Surplus.
		A. Conservancy and Works.	B. Establishments and Contingencies.	Total.	
	Rs.	Rs.	Rs.	Rs.	Rs.
1874-75	23,137	..	1,276	1,276	21,861
1875-76	16,109	..	1,528	1,528	14,581
1876-77	20,985	..	4,003	4,003	16,982
1877-78	29,243	50	5,213	5,263	23,980
1878-79	27,074	..	1,623	1,623	25,451
1879-80	17,184	733	1,874	2,607	14,577
1880-81	21,471	412	6,456	6,868	14,603
1881-82	12,694	549	6,427	6,976	5,718
Total ..	167,897	1,744	28,400	30,144	137,753
Average ..	20,987	212	3,550	3,790	17,219

The estimate for the current year is—

	Rs.
Receipts	25,490
Charges	6,071

There is no apparent reason for anticipating so large an increase in receipts, and it seems doubtful whether the estimate will be realized.

The falling off in the receipts is ascribed to the gradual deterioration of the forests and to the competition of the timber extracted from the forests in the Malkagiri taluk of Jeypore. It is reported that the timber traders, who usually cut in these forests, have recently been induced by the offer of more favorable terms to transfer their business to the Malkagiri forests. The chief item of revenue is the seigniorage levied on different kinds of wood at rates ranging from three annas to one rupee per log. In 1880-81, this item yielded Rs. 19,379, the rest was made up by seigniorage on forest produce and fuel.

720. While these taluks were in the Central Provinces, the Forest Rules of the 22nd August 1865, drawn up under Act VII of 1865, were probably in force. It is stated that the rules were retained under the Government of Madras, with certain modifications. The references to the rules, however, which I find in the papers are in some respects at variance with the rules of 1865. Again, while the taluks were under the Chief Commissioner of the Central Provinces, the practice probably was, here as in other districts, that the people paid for pasture and for all forest produce which they took from the Government forests. Possibly they may have paid a certain annual rate per house for grazing, grass, and firewood under the so-called commutation system. Of this I find no trace in the reports, unless indeed the *pullari* or grazing tax paid by the Telugus for grazing and firewood, and the *ippa pannu* paid by the other tribes for the privilege of collecting the flowers of the *Bassia* (ippa or mhowa) are the remains of the commutation system under the Central Provinces. The proceeds of the *pullari* tax are not classed as Forest Revenue, and I do not know whether it continues to be paid. The hill tribes (Koyas and Reddis) have been exempted from the *ippa pannu*.

It is not however necessary to enter into this matter, and the only question of practical importance in this respect is the manner in which *pôdu*—temporary cultivation by clearing and burning the forest—was dealt with. It is stated that, under the Central Provinces, no restrictions were placed upon *pôdu* cultivation, except that the felling of teak and a few other reserved trees was absolutely prohibited. Rule XIV of the Central Provinces Rules of 1865 deals with *pôdu* under the name of *dhya*; and its provisions were as follows:—"No *dhya* is to be cut in any place where any of the seven interdicted kinds are growing, without the permission of the Deputy or Assistant Commissioner, or Tahsildar of the district."

721. So much seems clear, that in 1874, when the taluks were transferred to Madras, the practice was that the hill tribes were permitted to carry on this cultivation anywhere in the Government forests, with the single restriction that no teak was to be cut in the clearings. Under the *régime* of the Madras Government, after the issue of local orders in 1875, first prohibiting *pôdu* cultivation altogether and then allowing it, an order was passed by the Board of Revenue in 1877 to the effect that the *pôdu* cultivation of each village must be restricted to tracts set apart for the purpose, which should be four times as large as the area cultivated during the previous year; and it was ordered by the Collector that teak growing on these allotments must be paid for or handed over to Government officers. This rule appears to have been oppressively worked; and after a temporary revival of the original rule, permitting *pôdu* cultivation anywhere, but prohibiting the cutting of teak, the Government decided in their order of the 11th March 1880, No. 310, that *pôdu* cultivation should be restricted to selected tracts, of an area eight times as large as that usually cultivated by each village in one year, and all restrictions as to cutting teak within these areas were removed. I have been informed that these allotments had been demarcated and had been assigned to the villages. But as a matter of fact *pôdu* cultivation is carried on, without any restriction, anywhere in the Government forests outside the areas which have been declared reserves, as will presently be explained.

As Mr. Foster, the Collector, states, in a memorandum of the 12th April last, written for the guidance of the local Forest Officer, "for purposes of *pôdu* cultivation, people can cut down any tree without restriction, and they can carry on the cultivation anywhere outside the reserves." This view of the case is based upon the order of Government, No. 792, dated the 10th July 1880, which is as follows:—"In regard to *pôdu* cultivation, it must be distinctly understood that its discontinuance outside the reserved forests has not been sanctioned by Government."

722. The question of the formation of forest reserves in these taluks engaged the attention of the Government of Madras soon after their acquisition, and a special officer (Mr. Boileau) was, in 1876 and 1877, employed in selecting reserves. He selected three reserves in Bhadráchalam (area 22 square miles) and nine reserves in Rékapalle (area 116 square miles.) But as it was not certain whether the whole of the land included in these proposed reserves was at the disposal of Government, a further inquiry was ordered with the view to exclude all land which was not Government property. This has been done, and the result is that at present the reservation of the following areas has been sanctioned by the orders of Government, No. 792, dated the 10th July 1880, and No. 1107, dated the 8th September 1880:—

Bhadráchalam taluk, three blocks, 8 square miles.
Rékapalle taluk, nine blocks, 60 square miles.

Thus 68 square miles, in twelve blocks, out of a total area of 520 square miles of Government forest, or 13 per cent. of the land at the disposal of Government have been set apart as reserved forest.

723. These areas are very small, six of them measure from one to three square miles, and two only contain over ten square miles. It is exceedingly doubtful whether the maintenance of the smaller areas can be of any practical use. In an open well-populated country which is traversed by roads, where it is easy to move about rapidly and where the forests stand out from the surrounding fields, reserves of small extent can be protected without undue expense, and can be profitably managed; but in a wild country, the greater part of which is forest or jungle, it is a hopeless task to deal with any but blocks of large extent and compact shape.

A recent report from the Deputy Conservator of Forests to the Conservator shows that eleven out of the twelve reserves have been demarcated by heaps of stones, and that, though the boundaries of the reserves have not been notified by the Collector in the District Gazette, the neighbouring villagers have been informed by the Deputy Conservator of the position of the reserves, and warned not to cut wood within them.

724. The protection of these small areas is, to judge from the local Forest Officer's reports, little more than nominal. This seems to be due to several causes: the reserves, though sanctioned by Government, have not apparently been publicly notified by the Collector, and there seems to be no resident protective establishment. According to Mr. Boileau's reports, the reserves are in charge of four guards, who have besides to control the timber exported on the voucher and license system, and who probably live at a distance from the reserves. Howsoever that may be, encroachments seem to be numerous.

In reserve No. IX (area three square miles) the hillmen have, since 1876 when the reserve was first selected, established a village and cannot legally be evicted. The Special Assistant Agent has, however, promised to use his influence to induce these people to move elsewhere.* If this cannot be done, protection will be impossible and the reserve must be abandoned, for the maintenance of an area of less than three square miles will probably be useless. Two new settlements are also reported to have been made in No. XII reserve (area 20 square miles) which may be difficult to deal with.†

* Correspondence between the Special Assistant Agent and the Deputy Conservator of Forests, April 1882.

† Deputy Conservator's report for April 1882, dated the 8th May 1882.

And on a recent inspection the Deputy Conservator found felling of timber for *pôdu* cultivation in reserve ‡ No. VII (area 8 square miles). This is a reserve which is stated to be demarcated, but not completely, with stone cairns.

‡ Deputy Conservator's report for February 1882, dated the 17th March 1882.

Reserve No. X (area 11 square miles) has not been demarcated, and it is reported § that the people of an adjoining village are in the habit of cutting *pôdu* in it, and that a new village has sprung up within its limits. The Deputy Conservator proposes to abandon it and to take up an adjoining area in its stead.

§ Deputy Conservator's report for June 1882, dated the 12th July 1882.

725. It is not clear whether any of these clearings in the reserves were made after the reserves had been sanctioned by Government in 1880, nor does it appear from the records of the Conservator's Office that the arrangements made by the local Forest Officers for the protection of the reserves were efficient; but in any case it seems doubtful whether further encroachments can be prevented. The present Acting Collector, Mr. Happell, has stated, in a letter to the Conservator, No. 334, dated the 19th June last, that endeavours will be made to preserve the reserves from encroachment, but that he is not sanguine of success.

726. The forests not included within the so-called reserves measure 452 square miles, and in these the present condition of matters is as follows:—

Pôdu cultivation is allowed anywhere without restriction; teak as well as all other kinds of trees are cut and burnt freely in the areas cleared for cultivation.

Licenses for cutting timber for export are granted by the Forest Darogah or Tahsildar; half the fee is paid on the issue of the license, and half when the wood is cut. A time is fixed in the license within which wood must be cut on pain of forfeiture of the first instalment of the fee. After the payment of the second instalment, a pass is issued to cover the wood in transport. Penalties may be levied for cutting in unauthorized places or contrary to the terms of the license.

Wood for agricultural and domestic purposes is allowed free to all Government and Zemindari ryots and others. A pass is supposed to be obtained from the Kurnams, but, as a matter of fact, the wood is generally taken by the people at their pleasure; and from a recent report of the Deputy Conservator, it would appear that the Koyas (hillmen) are in the habit of selling some at least of the timber which they thus obtain, and of selling, after harvest, poles which they have cut for agricultural purposes.‖ This latter practice the Acting Collector does not see his way to stop.

‖ Deputy Conservator's report for May 1882, dated the 8th June 1882.

727. Teak alone is reserved, and when taken for agricultural or domestic use, one-quarter of the usual seigniorage has been ordered to be charged; but, as teak in *pôdu* cultivation may be cut free, the practical object of this rule is not apparent. In his memorandum of the 12th April last (already quoted) the Collector, Mr. Foster, writes on this subject as follows:—

"The Deputy Conservator objects to teak being used for field platforms. When the ryots cut the teak tree in making *pôdu* cultivation, they are free to use them as they like."

The cutting of teak in *pôdu* cultivation and the sale of wood cut free for domestic and agricultural requirements, have been repeatedly brought to notice by the Deputy Conservator; but the Acting Collector, in his letter to the Conservator of the 19th June (already quoted), has stated that the principles followed in regard to these matters have been adopted by Government for political reasons, and that he is not at present prepared to recommend their alteration.

728. The question now arises, what policy is to be followed in future. The existing state of things is not satisfactory and must not be permitted to continue. The forests are not protected, they deteriorate steadily, the revenue is diminishing, and although, as a matter of fact, there is now no material restriction whatever upon the use of the forests by the people, the people are nominally required to take out free passes for the wood they require, and there is still the possibility of this, as well as the general supervision which the Forest Officers are expected to exercise, being used for extortion and oppression. Under these circumstances it is for consideration whether it is not best altogether to abandon forest conservancy in these taluks and to withdraw the Deputy Conservator of Forests and the forest establishment from the Godávari District.

This would certainly be my conclusion if the forests in the large extent of wild and hilly country which surrounds these taluks on all sides were under the control of Government. There are extensive and most valuable forests of teak and sál in Jeypore on the Severy river and its feeders, and in Bustar on the hills drained by the Indrávati river; and some good forest is probably left in the Nizam's territory on the right bank of the Godávari. The rich delta of the Godávari and the open country of the adjoining districts are supplied with timber floated down from these forests, and distributed both up and down the coast and the canals. I have not been able to collect any data regarding the Godávari timber trade, but it must be very considerable. Over none of the forests, which at present yield the timber brought down the Godávari river, does Government exercise any control, the exhaustion of these forests is only a work of time, and, as prosperity and population increase, the destruction of the forests on these hills will be accomplished by grazing, fires, indiscriminate cutting, and *pôdu* cultivation.

729. The only forests in British territory, besides those of Rékapalli and Bhadráchalam, from which timber is occasionally floated down the Godávari river, are those of the Sironcha District and the Ahiri Zemindari in Chanda. The more valuable forests of Ahiri have been purchased by Government and are under efficient management, but nearly the whole of the timber produced by them is floated up-stream to Wardha and Kampti. Under these circumstances I am disposed to think that an attempt should be made to preserve and to manage efficiently a portion of the Government forests in these two taluks. It is true that they do not at present contain any teak timber of large size, but from all accounts it appears probable that, if they were placed under efficient protection, good teak would again be produced, besides other kinds of timber which would find a ready market in the low country. The forests of these two taluks have the advantage of proximity to the market, and, though they can only be expected to yield a scanty revenue while the timber in the reserves is growing up, they will doubtless repay the money laid out upon their protection and improvement.

730. If these views are accepted, then the question must be solved whether it is possible to select reserves of a suitable size, with forest and other conditions sufficiently promising to justify their demarcation and protection. If this is not possible, then the idea of forest administration in these taluks must be abandoned. The existing reserves cannot be expected to accomplish the object aimed at. In

all the larger ones there are villages and *pôdu* cultivation; the second largest (X), the Deputy Conservator proposes to abandon; and, as already explained, the majority of them are much too small to be useful in a wild country like this.

Unless the population is very much larger than it has been reported, it ought not to be difficult to select a number of blocks of suitable size with good boundaries.

731. At first sight it would appear unlikely that this can be done, for the first reserves selected by Mr. Boileau were rejected, because they included villages and cultivation, and their boundaries were altered in order to exclude them; and, as already stated, even in several of the reduced reserves there are settlements and recent *pôdu* clearings. It might be objected that nothing but these small areas is left at the disposal of Government; but there are passages in Mr. Boileau's reports which seem to show that, with a careful and patient inquiry on the spot, it may not be impossible to improve matters. Thus, in his report for February 1882, he states, with reference to reserve No. V (area 1½ square miles) that, as a cart track runs through the reserve, he had, in accordance with an order by Government, to keep to one side of the road, and to exclude the land on the other side. I am not acquainted with any order of Government requiring that no public roads should run through a reserved forest, and I am inclined to think that no such order exists. The interior of reserved forests must be made accessible by roads, and it is much better that there should be traffic upon such roads than that they should not be used.

Again, in the report in which the Deputy Conservator states his intention to abandon reserve No. X, he seems to anticipate no difficulty in selecting another and better block in the vicinity of the Severy river, in which he says that there is no village.

732. I am ready to admit, however, that Mr. Boileau single-handed, without the guidance and advice of an officer who has had special experience in such work, cannot be expected to be more fortunate in a fresh selection than he has hitherto been. If therefore it is decided to make a new selection of reserves, this work must be entrusted to an officer who has had special experience. But before any action is taken in this respect, it must be settled whether the Forest Act shall be extended to these taluks, which, being scheduled districts, have been specially exempted from its operation. Should it not be decided to extend the Act, then forest conservancy in these taluks had better be abandoned. Should, however, the Act be extended, then the first step must be the selection, demarcation, and efficient protection of reserved forests of sufficient size and compact shape. The conditions of efficient protection of these reserves are skilfully-selected boundaries, conspicuous boundary marks, a good system of paths and roads through the reserves, and a well-organized establishment of forest guards residing on the spot. The Deputy Conservator should, during the healthy season, unless he has work elsewhere, reside in these taluks. The work cannot be done by means of periodical visits. These are the essential conditions of a good management of the reserved forests.

In advocating the formation of large reserves of compact shape, I do not overlook the fact that in some cases it may be necessary to prohibit *pôdu* cultivation in belts of land along the banks of streams and on their head-waters, in order to maintain the water-supply in springs and streams for the people. Such belts might either be made reserved forests under the Act, or *pôdu* clearings in them might be prohibited under rules to be made under it.

733. As regards the Government forests that will not be included within the reserves, the following remarks are submitted on the understanding that the Act will be extended to these taluks. I do not see how the existing practice under which *pôdu* clearings may be made anywhere without restriction can now be materially modified. The allotment of a tract to each village, to which *pôdu* clearings shall be confined, cannot apparently be carried out. In the forests of Burma, and chiefly in the hills inhabited by Karens, the plan has been in force since 1878, and has succeeded well. But the areas there assigned for *toungya* cultivation (Karen areas) are very extensive, comprising from 50 to 120 times the extent of the annual clearings, and the habits and requirements of the Karens have been most

carefully considered in selecting these areas and fixing their boundaries. It is, however, at best a difficult experiment, and I doubt whether it would succeed under the circumstances which appear to exist in the Bhadráchalam and Rékapalle taluks.

734. The abandonment of all restriction on the cutting and burning of teak is, I think, to be regretted, and, had these restrictions not been abandoned already, I should certainly have urged their maintenance, at least until a sufficient area of reserved forests has been finally constituted under the Act, and until the complete protection of these reserved forests has been secured. Under existing circumstances it is for serious consideration whether in case the Forest Act is extended the cutting and injuring of teak should not be prohibited by rules made under the Act. This would virtually make teak a reserved tree. I do not think that it would be hard upon the people to do this. Teak trees standing in a *pôdu* clearing must of course suffer, but it is not necessary for the welfare of the people that they should be deliberately cut and burnt. The chief advantage of protecting teak will be that, when hereafter an extension of the reserves is made, by including abandoned *pôdu* clearings, there will be more teak on the ground to shed seed and throw up coppice shoots, and there will besides remain scattered groups and belts of this tree on pieces of rocky ground, on the tops of the hills or on steep slopes, the produce of which will be exceedingly useful for the people themselves. In several districts of Burma where teak has been protected, small patches of forest, partly or wholly teak, are often left in the midst of the open cultivated country to the great advantage of the people.

735. It should also be considered whether two other useful trees, *Terminalia Chebula* (karaka) and the ebony *Diospyros Melanoxylon* (tunki), should not be protected against extermination by being declared reserved trees. *Terimnalia Chebula* yields the myrobalans of commerce, and this product might be made a source of much profit to the people. In a letter regarding the falling off of the trade on the Godávari river of the 1st April last, Mr. Foster, the Collector, writes as follows regarding this tree :—

"Several jungle products have become scarce owing to reckless treatment. Thus myrobalans which used to be exported very largely are now becoming extremely scarce, because the jungle tribes, instead of merely gathering the nut, cut down the whole tree."

The fruit of the ebony is eaten by the hill tribes and is sold to the people of the open country. Mr. Boileau, the Deputy Conservator, in a letter to the Collector, dated the 5th March 1880, reports as follows regarding the indiscriminate destruction of this tree :—

"Before concluding I must bring to notice that when inspecting I saw tunki (ebony) trees of good dimensions on the ground, which had been felled for the purpose of gathering the green fruit without exertion. The unripe fruit goes through a *forcing* process; it is collected in this state as soon as possible to save themselves labor and to prevent other villages which are as near, also bears, from getting the produce, and is afterwards either eaten by themselves or taken to the villages on the Godávari for sale. Some of the Koyas object to the system strongly, because it reduces the number of fruit-bearing trees. I should discourage it on the same account, and also because it is quite unnecessary."

Such reckless destruction of valuable trees ought to be stopped, and this will cause no hardship to the people. On the contrary the hill tribes themselves will be the greatest sufferers if such waste is permitted to continue. I would therefore suggest that, if the Act is extended to these taluks, teak *Terminalia Chebula* and *Diospyros Melanoxylon* be declared reserved trees, so as to secure their protection on all lands at the disposal of Government.

736. As regards *pôdu* cultivation I submit that if the population increases, which it seems likely to do, the hills will eventually be denuded, and then this mode of cultivation must necessarily come to an end, because there will be no jungle left to cut and burn and fertilize the ground. What I mean to say is this : that though, at the present time, unrestricted *pôdu* cultivation is held to be beneficial for the people, it cannot be expected to secure their welfare as a permanent arrangement. The only measures then which, in case the Act is extended to these taluks, I recommend in the interests of forest conservancy are the selection, demarcation, and efficient protection of reserved forests of sufficient size and compact shape, and the

special protection of a few valuable trees. If these measures cannot be accomplished, then I am of opinion that forest administration in these taluks had better be given up altogether.

737. If forest conservancy is to be maintained, it must be considered how the cost of it is to be met. No revenue can, for many years to come, be obtained from the reserved forests. A proposal has, I understand, been made, that fellings should now commence in the reserves. This, if permitted, would defeat the object for which they were constituted. The first point to be aimed at must be to let the forest in these reserves grow up into thick compact masses, and not until that has been accomplished should fellings commence.

Revenue therefore must be obtained from the waste and forest not included within the reserves, and here the difficulty is that, in consequence of the concessions made since the taluks were transferred to Madras, the inhabitants obtain all forest produce free. The only exception is the *pullari* tax, said to be paid by the Telugu villages. With this exception, the use of wood and all other forest produce by the inhabitants of the taluks is free and unrestricted. Hence the only possible source of revenue is the timber and forest produce that is exported from these lands.

The revenue from this source has, however, been much curtailed by the practice which has gradually been permitted to grow up to allow the hill tribes, not only to provide themselves with wood and other forest produce for their own requirements, but to sell and export produce originally obtained for their own use. The necessary consequence of such concession has been the gradual decrease of the forest revenue.

Under these circumstances it is for consideration, whether it is possible, under existing circumstances, to obtain sufficient revenue from these taluks to cover the cost of forest conservancy.

Formerly the Godávari District yielded a considerable surplus revenue, and the question whether forest conservancy can or cannot be maintained in these taluks must in some measure depend upon the arrangements which may be made in regard to the future forest revenue.

I.

Area and Population.

Districts.	Zemindari, Shrotriem, and Inam Lands.	Government Lands				Total Area of Districts.	Population, 1871.	Population, 1881.	Population, 1881, per Square Mile.	Remarks.
		Unoccupied.	Occupied.							
			Wet.	Dry.	Waste.					
1	2	3	4	5	6	7	8	9	10	11
	ACRES.	ACRES.	ACRES.	ACRES.	ACRES.	ACRES.				
1. Ganjam ...	3,814,880	1,176,605	145,802 (a)	165,574 (a)	16,179 (a)	5,319,040	1,520,088	1,749,604	211	Includes Parla Kimedi and other Zemindaries.
2. Vizagapatam ...	8,159,503	2,879,256	23,169	52,617	8,655	11,123,200	2,296,351	2,485,141	143	Includes Jeypore, Vizianagram & other Zemindaries.
3. Godávari ...	1,804,800	2,138,622	291,929	241,565	223,884	4,700,800	1,592,939	1,791,512	244	Includes Pithapuram and other Zemindaries.
4. Kistna ...	1,758,080	1,886,173	186,133	1,239,324	351,730	5,421,440	1,452,374	1,548,480	183	Includes Nuzvid and other Zemindaries.
5. Anantapur ...	622,028	1,888,771	61,113	762,258	132,710	3,466,880	1,653,010			
6. Bellary ...	826,750	1,456,151	31,271	1,014,368	144,100	3,472,640		1,336,696	121	
Sandur ...	.....	.....	.....	.....	.....	104,960	14,986			Tributary State.
7. Kurnool ...	1,038,408	2,820,589	21,684	865,865	74,574	4,821,120	914,432			
Banganapalli ...	.....	.....	.....	.....	.....	163,200	45,208	709,305-	91	Do. do.
8. Cuddapah ...	772,480	3,658,658	100,749	910,886	149,547	5,592,320	1,351,194	1,121,038	128	
9. Nellore ...	3,136,640	1,486,668	171,848	578,103	219,701	5,592,960	1,376,811	1,220,236	140	Includes Venkatagiri and other Zemindaries.
10. North Arcot ...	2,308,210	1,731,886	196,633 (a)	353,413 (a)	79,298 (a)	4,669,440	2,015,278	1,817,814	249	Includes Karvetnagar, Arni, Punganúr, Kangundi, and part of Kalahasti Zemindaries.
11. Chingleput ...	518,670	760,348	283,988 (a)	143,462 (a)	112,412 (a)	1,818,880	938,184	981,381	345	
12. Salem ...	1,390,912	2,577,781	83,824	810,325	83,718	4,946,560	1,966,995	1,599,595	207	
13. South Arcot ...	176,129	1,734,728	258,106 (a)	812,985 (a)	136,772 (a)	3,118,720	1,755,817	1,814,738	372	
14. Trichinopoly ...	641,920	508,856	126,353 (a)	664,338 (a)	178,213 (a)	2,119,680	1,200,408	1,215,033	367	
15. Tanjore ...	628,480	649,881	703,889 (a)	219,433 (a)	136,877 (a)	2,338,560	1,973,731	2,130,383	583	
Puducottah ...	.....	.....	.....	.....	.....	704,640	316,695	302,127	274	Tributary State.
16. Madura ...	3,774,835	803,448	127,982	530,835	139,540 (a)	5,376,640	2,266,615	2,168,680	258	Includes Ramnad and Shivaganga Zemindaries.
17. Tinnevelly ...	1,127,672	928,542	177,022 (a)	811,852 (a)	398,752	3,443,840	1,693,959	1,699,747	310	Includes Singampatti and other Zemindaries.
18. Coimbatore ...	351,738	2,348,532	81,510	1,722,891	489,889	4,994,560	1,763,274	1,657,690	212	
19. Malabar ...						3,688,320	2,261,250	2,365,035	410	Population 1871 includes South-East Wynaad, since transferred to Nilgiris.
20. Nilgiris ...	Correct details for these three districts not available.					612,480	49,501	91,034	95	Population 1871 does not include South-East Wynaad.
21. South Canara ...						2,497,280	918,362	959,514	246	
22. Madras ...			17,280			17,280	397,552	405,848	15,031	
Total ...	32,852,135*	31,435,495*	3,073,005*	11,900,094*	3,076,551*	90,125,440	31,735,014	31,170,631	221	

The area of the eighteen districts for which details are given amounts to 82,337,280 acres, and the totals marked * are those for the same eighteen districts.

The figures in column 2 are taken from information supplied by the Superintendent, Revenue Survey, and from returns furnished by Collectors to the Board of Revenue for the census of 1881.

The figures in column 3 are the difference between details and total.

The figures in columns 4, 5 and 6 when marked (a) are taken from the Jamabandi Reports by Collectors to the Board of Revenue for Fasli 1291; in other cases they are taken from the Jamabandi Report for Fasli 1290 submitted by the Board of Revenue to Government.

The figures in column 7 are from information supplied by the Superintendent, Revenue Survey.

II.—Average Annual Receipts and Charges on account of Forests and Jungle Conservancy calculated on the actuals of the five years ending 1880-81.

Districts.	Receipts.			Charges.			Surplus.	Deficit.
	Jungle Conservancy.	Forests.	Total.	Jungle Conservancy.	Forests.	Total.		
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Ganjam	158	11,927	12,085	205	6,101	6,306	5,779	...
Vizagapatam	868	13	881	506	80	586	295	...
Godâvari	6,706	23,191	29,897	1,332	4,073	5,405	24,492	...
Kistna	10,915	...	10,915	11,506	...	11,506	...	591
Bellary	2,576	...	2,576	2,676	...	2,676	...	100
Kurnool	2,659	11,901	14,560	2,814	14,271	17,085	...	2,525
Cuddapah	13,197	58,115	71,312	7,690	25,510	33,200	38,112	...
Nellore	66,458	...	66,458	68,793	...	68,793	...	2,335
North Arcot	18,810	28,503	47,313	19,102	23,868	42,970	4,343	...
Chingleput	10,334	...	10,334	7,334	...	7,334	3,000	...
Madras	73	...	73	...	...	...	73	...
Salem	29,906	61,132	91,038	20,195	22,702	42,897	48,141	...
South Arcot	9,238	9,306	18,544	9,667	19,554	29,221	...	10,677
Trichinopoly	7,584	2,446	10,030	5,979	9,126	15,105	...	5,075
Tanjore	7,561	...	7,561	6,798	...	6,798	763	...
Madura	3,372	18,041	21,413	3,190	15,893	19,083	2,330	...
Tinnevelly	7,775	24,180	31,955	8,306	25,198	33,504	...	1,549
Coimbatore	14,723	72,174	86,897	12,424	64,689	77,113	9,784	...
Malabar	5	51,209	51,214	5	47,769	47,774	3,440	...
Nilgiris	49	39,417	39,466	...	45,044	45,044	...	5,578
South Canara	375	3,105	3,480	506	12,412	12,918	...	9,438
Central Office	...	...	...	...	38,410	38,410	...	38,410
Totals ...	2,13,342	4,14,660*	6,28,002	1,89,028	3,74,700*	5,63,728	1,40,552	76,278

Average net surplus ... Rs. 64,274.

* Figures for "Forests" obtained from the Conservator's Office, Madras.
The figures recorded in the Review of Forest Administration for 1880-81 yield the following averages:—

	Rs.
Receipts	4,14,153
Charges	3,74,299

III.—Actual Receipts and Charges on account of Forests and Jungle Conservancy for 1881-82.

Districts.	Receipts.		Total.	Charges.		Total.	Surplus.	Deficit.
	Jungle Conservancy.	Forests.		Jungle Conservancy.	Forests.			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Ganjam	83	62,270	62,353	142	11,808	11,950	50,403	...
Vizagapatam	1,346	...	1,346	208	...	208	1,138	...
Godâvari	6,198	12,694	18,892	2,947	6,976	9,923	8,969	...
Kistna	16,859	...	16,859	14,493	...	14,493	2,366	...
Bellary	13,367	...	13,367	1,494	4,171	5,665	7,702	...
Kurnool	2,794	29,304	32,098	1,052	14,976	16,028	16,070	...
Cuddapah	17,346	46,801	64,147	17,124	30,417	47,541	16,606	...
Nellore	81,048	...	81,048	75,215	...	75,215	5,833	...
North Arcot	33,934	41,103	75,037	30,685	31,106	61,791	13,246	...
Chingleput	6,784	...	6,784	7,455	...	7,455	...	671
Madras	...	...	...	...	...	...	...	...
Salem	42,421	42,537	84,958	16,593	26,895	43,488	41,470	...
South Arcot	11,158	13,052	24,210	10,821	17,366	28,187	...	3,977
Trichinopoly	12,180	5,175	17,355	5,434	5,270	10,704	6,651	...
Tanjore	13,518	...	13,518	8,096	...	8,096	5,422	...
Madura	5,567	22,765	28,332	2,125	14,719	16,844	11,488	...
Tinnevelly	9,186	24,132	33,318	9,271	27,086	36,357	...	3,039
Coimbatore	25,764	93,583	1,19,347	9,733	54,762	64,495	54,852	...
Malabar	...	68,370	68,370	...	54,567	54,567	13,803	...
Nilgiris	...	34,377	34,377	...	34,840	34,840	...	463
South Canara	637	10,293	10,930	541	9,071	9,612	1,318	...
Central Office	...	...	...	...	45,862	45,862	...	45,862
Totals ...	3,00,190	5,06,456	8,06,646	2,13,429	3,89,892	6,03,321	2,57,337	54,012
Adjusted by the Accountant-General, Madras.	...	+ 254	...	...	+ 1,294	...	...	1,040
	3,00,190	5,06,710	8,06,900	2,13,429	3,91,186	6,04,615	2,57,337	55,052

Net surplus ... Rs. 2,02,285

IV.—Estimated Receipts and Charges on account of Forests and Jungle Conservancy for the year 1882-83.

Districts.	Receipts.		Total.	Forecast.	Charges.		Total.
	Jungle Conservancy.	Forests.			Jungle Conservancy.	Forests.	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Ganjam	120	28,250	28,370	20,000	120	11,299	11,419
Vizagapatam	1,000	...	1,000	1,000	220	816	1,036
Godávari	9,610	25,490	35,100	18,000	4,280	6,071	10,351
Kistna	12,050	...	12,050	30,000	14,340	...	14,340
Bellary	8,000	...	8,000	15,000	12,540	4,860	17,400
Kurnool	2,250	22,180	24,430	40,000	1,470	15,784	17,254
Cuddapah	20,820	57,980	78,800	1,00,000	19,790	31,748	51,538
Nellore	86,650	...	86,650	1,00,000	79,870	...	79,870
North Arcot	30,000	36,650	66,650	70,000	27,750	31,359	59,109
Chingleput	6,000	...	6,000	6,000	8,180	...	8,180
Madras	...	...	...	...	...	...	...
Salem	38,440	51,500	89,940	1,00,000	20,270	27,902	48,172
South Arcot	9,000	14,000	23,000	30,000	10,500	20,511	31,011
Trichinopoly	9,250	3,460	12,710	20,000	6,110	4,567	10,677
Tanjore	9,540	...	9,540	10,000	14,970	...	14,970
Madura	3,690	21,000	24,690	30,000	2,220	15,355	17,575
Tinnevelly	5,400	32,350	37,750	40,000	6,420	43,013	49,433
Coimbatore	16,350	79,500	95,850	1,10,000	26,150	48,755	74,905
Malabar	...	58,900	58,900	80,000	...	54,093	54,093
Nilgiris	...	39,740	39,740	60,000	...	36,220	36,220
South Canara	520	9,000	9,520	20,000	620	9,735	10,355
Central Office	...	...	...	...	...	1,07,912	1,07,912
Totals ...	2,68,690	4,80,000	7,48,690	9,00,000	2,55,820	4,70,000	7,25,820

V.—Graded List of the Jungle Conservancy Fund Establishment.

District.	Designation of Servant.	Rate of Salary and Allowances.	District.	Designation of Servant.	Rate of Salary and Allowances.
		Rs.			Rs.
North Arcot.	1 Ranger, 3rd Class ...	60 + 15	Bellary ...	Information not available.	...
	1 Forester	20 + 10	South Canara	1 Watcher	6
	1 Forester	30		3 Watchers	3
	1 Sub-Forester	15	Chingleput..	1 Superintendent or Maistry.	16 + 4
	1 Gumastah	15		2 Maistries	6
	1 Do.	12		2 Do.	5
	1 Sub-Forester	12		12 Peons	5
	1 Maistry	12		3 Watchmen	5
	6 Pygusts	10		13 Gardeners	5
	1 Pygust	8		4 Do.	4½
	3 Maistries	8		2 Do.	4
	1 Duffadar	8		29 Do.	3½
	1 Watcher or Forest Guard	8		4 Do.	2½
	2 Peons	7		2 Do.	2¼
	17 Watchers or Forest Guards.	7		3 Watchmen	1
	19 Watchers or Forest Guards.	6		1 Clerk in the Collector's Office.	40
	1 Peon	6		2 Rangers	30
	2 Gardeners	6		1 Gumastah	12
	9 Watchers or Forest Guards.	4		1 Peon	7
South Arcot.	1 Manager	50	Coimbatore..	2 Peons	6
	1 Clerk	20		10 Gardeners	5
	1 Do.	15		3 Bullock-men	5
	1 Office Peon	7		4 Servants	5
	2 Superintendents ...	20		1 Servant	5
	5 Do. ...	15		3 Servants	4
	1 Pygust or head watcher	10		12 Wood-wards	4
	1 Do. do. ...	8		3 Servants	3
	6 Pygusts or head watchers.	7	Cuddapah ...	1 Overseer	75 + 15
	1 Sub-Watcher	6		1 Do.	20
	2 Sub-Watchers	5		2 Overseers	15
	7 Peons or Tanadars ...	5		2 Gumastahs	10
	4 Do. do. ...	4		2 Servants	6
	7 Sub-Watchers ...	4		52 Gardeners	6
	4 Gardeners	4		67 Do.	5
	5 Sub-Watchers ...	3½		43 Watchmen	5
	12 Gardeners	3½		63 Gardeners	4
	71 Sub-Watchers ...	3		16 Do.	3
	5 Gardeners	3	Ganjam ...	3 Gardeners	3

Graded List of the Jungle Conservancy Fund Establishment—(*Continued*).

District.	Designation of Servant.	Rate of Salary and Allowances.
		Rs.
Godávari ...	1 Supervisor	100 + 25
	1 Gumastah	20
	2 Peons	7
	2 Gardeners	6
Kistna ...	1 Overseer, including travelling allowance.	65
	1 Overseer	30 + 15
	3 Gumastahs	15 + 5
	3 Survey Amins ...	15
	2 Maistries	12
	5 Do.	10
	1 Peon	6 + 1½
	1 Do.	6
	7 Watchers	6
	95 Do.	5
	79 Gardeners	5
	3 Peons	5
	2 Gardeners	4
Kurnool ...	26 Gardeners	4
Madura ...	1 Maistry	5
	1 Watcher	5
	23 Watchers	4
	4 Gardeners	4
	1 Gardener	3
	1 Watcher	2½
Nellore ...	1 Wood Overseer ...	120 + 30
	2 Assistant Wood Overseers.	50 + 20
	1 Assistant Wood Overseer.	50
	1 Inspector	25 + 10
	3 Wood Maistries ...	20 + 10
	2 Inspectors	20 + 10
	1 Clerk in Collector's Office.	20
	1 Clerk	15 + 5
	1 Shroff	16
	1 Inspector	15
	2 Assistant Inspectors ...	15
	1 Assistant to the Assistant Wood Overseer.	15
	9 Wood Watchers ...	15
	2 Clerks	10 + 5
	1 Clerk	10
	4 Gumastahs	8
	7 Tanadars	8
	5 Maistries	7
	1 Peon	6
	5 Watchers	6
	1 Gardener	6
	5 Maistries	6
	1 Maistry	5½
	12 Gardeners	5¼
	140 Woodmen	5
	6 Assistant Maistries ...	5
	1 Watcher	5
	13 Gardeners	5
	4 Do.	4¼
	93 Do.	4
	2 Woodmen	3½
	5 Gardeners	3

District.	Designation of Servant.	Rate of Salary and Allowances.
		Rs.
Tanjore ...	1 Amin...	15
	1 Maistry	15
	1 Amin	12
	1 Maistry	10
	1 Do.	8
	1 Do.	6
	6 Maistries	5
	12 Gardeners	5
	25 Do.	4
	60 Watchmen	4
	11 Do.	3
Salem ...	1 Clerk in the Collector's Office.	25
	7 Maistries	15
	3 Do.	12
	2 Do.	20
	2 Peons	8
	1 Gardener	7
	1 Do.	6
	1 Do.	5½
	3 Gardeners	5
	201 Do.	4
	6 Do.	3½
	21 Do.	3
	1 Gardener	2½
	6 Gardeners	1
Tinnevelly...	2 Avenue Superintendents at Rs. 50* each.	25
	1 Maistry	20
	2 Maistries	12
	1 Maistry	10
	3 Gardeners	6
	23 Do.	5
	23 Watchmen	5
	5 Do.	4
	4 Gardeners	4
	2 Do.	3½
	9 Do.	3
	18 Do.	2½
	4 Do.	2
	1 Gardener	1½
	9 Gardeners	1
Trichinopoly	1 Ranger, 3rd-Class, including allowance.	75
	1 Forester	20
	1 Maistry	15
	1 Do.	12
	2 Maistries	7
	3 Do.	6
	12 Peons	6
	1 Office Watcher ...	5
	5 Peons	5
	2 Watchers	5
	1 Gardener	5
	6 Gardeners	4
	11 Watchers	4
	9 Gardeners	3½
	2 Do.	3
	1 Gardener	2½
Vizagapatam...	Information not available.	
Board's Office.†	1 Accountant	70
	1 Do.	30
	1 Do.	25
	1 Attender	8

* Only half is debited to Jungle Conservancy Fund, the other half being debited to Local Funds.

† Sanctioned for Special Local Fund Work.—*Vide* G.O., dated the 29th August 1872, No. 1229, F.D.

APPENDICES.

APPENDIX I.

JOINT REPORT ON FOREST LEGISLATION, MADRAS, DATED 10TH JUNE 1882.

In the orders of Government No. 338, Revenue, dated the 24th March, and No. 445, dated the 2nd May 1882, the undersigned were appointed a Committee for the purpose of preparing a Bill to provide for the protection and management of forests in this Presidency. We now submit, as the result of our deliberations, the accompanying Bill, with the following explanatory remarks.

2. We need not expatiate on the importance to the well-being of the country of a good forest administration, towards securing an adequate supply of timber and forest produce, and of cattle fodder, and towards fostering and maintaining the sources of streams and rivers. Nor need we enter in detail upon the question which has been so long agitated in this Presidency, whether the use of forest lands, which the people have enjoyed, has arisen out of right, privilege or custom. Such use of waste and forest land for collection of firewood and thorns for fences, for procuring timber for domestic and agricultural purposes, and for pasturing cattle free of payment or otherwise, undoubtedly exists, and has long existed.

3. If the user is exercised by virtue of a right, the right is vague and undefined. Lands in every district and of all kinds are daily given away on patta, notwithstanding that rights and customs have been exercised in them by the people up to the time when the patta was granted. Now and then, the persons who have been accustomed to graze their cattle on such lands raise objections; but, as a rule, the right of Government to give away waste lands is not disputed by the people on the ground of the customary user of pasture and forest produce.

In disposing of land under the waste land sale rules, Government does not, as a matter of course, sell more than its own rights in the land; but practically the purchaser becomes absolute proprietor. He holds his land subject to the existing and customary rights of Government and other persons in existing roads and paths, and in streams running through or bounding his land; but no purchaser under the waste land sale rules would tolerate the exercise, by the people of adjoining villages, of rights of pasture, or rights to wood and timber on his land. Formally these rights are not extinguished, but, as a matter of fact, they disappear.

The inference is, that in forests and waste lands, such as are ordinarily sold under the waste land sale rules, or such as might be granted on patta, the adjoining villages can exercise rights of user only so long as these lands are not allotted by the Government for cultivation, or required for other purposes.

4. We are content, however, that ordinarily the user shall be called and recognised as a right, though we believe that, in most cases, it is not exercised consciously as such, but only under the supposed sanction of custom; that it has been tacitly permitted rather than expressly recognised; and that, strictly speaking, there is no such thing as a private right of user in Government waste lands and forests.

We are further of opinion that there are no communal forests in this Presidency. The villagers are in the habit of collecting firewood, thorns for fences, and of pasturing their cattle on, driving them across, and themselves passing over waste lands, so long as these are not required by the Government for cultivation or other purposes; and to this extent they may be said to exercise common rights of pasture or other rights of user in the waste and forest lands included in their village areas. Such rights of user, however, are vastly different from proprietary rights, and their existence does not constitute the forests in which they are exercised communal forests.

5. But whether the use rests on right or not, it cannot be questioned that, on the one hand, the requirements of the people in the matter of wood and pasture must be satisfied; and that, on the other hand, the indiscriminate and uncontrolled exercise and extension of pasture and the use of forest-produce are incompatible with the preservation of the forests. Unregulated, such rights or privileges inevitably tend to destroy, but the regulation of them, under a system of conservancy, can be made consistent with an undiminished, and even with an increased, supply of forest produce and of cattle fodder. With the extension of cultivation, the woodlands on the open country have deteriorated or disappeared, and the so-called forest rights have sprung up in tracts which up to even recent times were free from them.

A forest law is required to enable Government to check this process, and to constitute forests to be permanently maintained as the forest domains of the State; to prevent further deterioration in wooded tracts, where the exercise of the rights must be allowed to continue; and to re-establish forest growth in places where it has disappeared. The result of these measures will be the formation of well-defined areas stocked with compact masses of forest, which will furnish a much more abundant supply of wood and cattle fodder than the present open and imperfectly stocked jungles.

6. The Bill, therefore, in the first place (Chapter II) enables Government to constitute the permanent forest domains of the State, which are generally designated as reserved forests. They might be called State forests, if this designation were not likely to lead to the misconception that the forests at the disposal of Government not included within the reserved forests were not State forests. This chapter provides the necessary machinery and procedure under which the boundaries of the forest can be fixed and settled, and within it all rights, other than those of Government, can be ascertained and, as far as possible, commuted and got rid of, or, if not got rid of, defined, recorded, and restrained from increase. This is the sole object in reservation: what is wanted is, that the forest areas shall be defined and permanently protected against alienation; and that the Government shall be at liberty to deal with them in the future as they may think fit. It is not to be supposed that the reserves when formed are to be strictly closed. Government will be free to close them if necessary, and generally to manage them so as best to secure the object in view. Some reserves will be selected for climatic reasons, some to protect the sources of rivers, and some to secure permanent supplies of forest produce where it is wanted; but all reserves will be worked and will be open to regulated use, so far as this can be allowed with safety and consistently with the maintenance of the forest.

7. In the second place, the Bill (Chapter III) provides for the protection of the forest growth and other natural produce on land at the disposal of Government, not included within reserved forests. It gives power to protect against alienation lands which it may be desirable to reserve on account of their containing or being capable of producing forest growth, and also to make rules for the conservancy of such growth in these and other lands. At the same time, it is provided that all rights enjoyed by individuals or communities in the lands to which the provisions of this chapter are applied are saved, and the protection of forest growth and natural produce is only contemplated as far as such protection may be compatible with the exercise of recognised rights.

8. A third and most important object of the Bill is to invest Government with the power of regulating the burning of grass and forest on private lands, when the protection of forest growth is necessary in order to maintain the water-supply in rivers required for irrigation, and in some places where Government and private forests are so intermingled that the former cannot be adequately protected unless the firing of the latter is brought under control. It obviously is of vital importance to maintain the water-supply in the rivers, and there is good ground for the opinion that, in many cases, the maintenance of such supply mainly depends upon the protection of the forests which clothe the catchment area of such rivers. As many of these forests are private property, some interference on the part of the State is unavoidable. Such interference has been limited to protection against fire, and, in dealing with the matter, we have stretched to the utmost limit consideration for the private proprietors to whose forests this portion of the Act may have to be applied.

These matters are dealt with in Chapter IV, which also empowers Government to apply the provisions of the Act to private forests, whenever the owners of such forests may request Government to do so.

9. By the provisions of Chapter V, power is given to Government to make rules to control the export of timber, either from its own forests or those of private owners, when such measures are necessary to prevent smuggling. Chapter VI lays down special rules of procedure for the guidance of Forest Officers, the police, and the magistracy, in dealing with forest offences, and provides penalties for certain mischievous or fraudulent acts not specifically mentioned in the Indian Penal Code, and for the abuse by Forest Officers of the powers of seizure and arrest entrusted to them. Chapter VII empowers Government to fix special fines to be paid for cattle trespassing in reserved forests or reserved lands. The powers which may be conferred on Forest Officers, and certain other provisions regarding them, are treated of in Chapter VIII; while Chapter IX contains such further miscellaneous provisions as are necessary for the working of the Act.

Definitions.

10. Such being the general scheme and scope of the Bill, we proceed to remark in detail on its provisions.

The first chapter contains the usual preliminary matter and definitions. It will be noticed that power is given to Government to exempt any place from the operation of the whole or any portion of the Act. This is an important provision, which will greatly facilitate the working of the Act. We make no attempt to define the word "forest," because, apart from the difficulty of framing a satisfactory definition, we think that all the objects in view can be

attained without one. Except as regards the control to be exercised over private forests, and as regards private lands, which it may be found necessary to include within the limits of reserved forests, and which will be acquired for Government either by arrangement or under the Land Acquisition Act, all operations are confined to Government waste, or as it is called in the Bill, "land at the disposal of Government." This we have defined as including all unoccupied land, whether assessed or unassessed, and as excluding all private property, *i.e.*, the property of landholders, as defined in Act VIII of 1865, Madras. We think that in this way all practical requirements will be found to be met. Our attention has been drawn to the fact that it was considered necessary when framing Madras Act I of 1878 (The Local Fund Amendment Act for Malabar) to include in the definition of "Landholders" the words "and all owners of land in the district of Malabar." As, in the definition of that same word in Section 1, Act VIII of 1865, Madras, which we have adopted in the Bill, those words do not occur, it might possibly be held that in our definition of "land at the disposal of Government" we did not mean to exclude land, the property of Malabar proprietors. We understand that the only reasons for introducing Act I of 1878 were the difficulties which lay in the way of working those provisions of the Local Fund Act (IV of 1871, Madras) which were applicable to properties in Malabar. Under these circumstances, we have thought it best to retain the definition of "Landholders" embodied in Act VIII of 1865, Madras, and to leave it to Government to decide whether that definition meets the case. None of the other definitions call for remark.

Reserved Forests.

11. The second chapter contains the provisions necessary for the constitution and protection of reserved forests. It is intended that, in the first place, the lands which it is proposed to constitute a reserved forest shall be selected by a Forest Officer, and that the Governor in Council shall then notify his intention to constitute the reserved forest, and shall appoint an officer, to be called the Forest Settlement Officer, who it is hoped will be a Civil Servant of some standing, to inquire into and settle claims and complete the definition of the tract; after which a further notification (Section 16) finally declaring the land to be a reserved forest shall be issued, and the necessary demarcation of the boundaries shall be made by the Forest Officer.

12. The first duty of the Forest Settlement Officer will be to issue a proclamation inviting claims to be submitted within a period of not less than three months. In addition to this he is required to take measures for giving to all persons interested due notice of what is proposed to be done. Such precautions having been taken, it is provided in Section 17 that the claims of persons who fail to come forward within the period allowed shall, in default of cause shown to the Forest Settlement Officer, be extinguished.

13. It obviously is of the utmost importance that, before any land is constituted a reserved forest, the rights of all persons interested in that land should be thoroughly investigated. Most of the forests which will be constituted reserves are situated in remote places, unhealthy during the greater part of the year, difficult of access, and often inhabited by wild and uncivilised tribes. Hence it will, in most cases, be difficult to ascertain exactly the nature and limits of such rights, and, whatever arrangements may be made, such inquiries will necessarily occupy a long time. Under these circumstances, it is advisable to make the procedure as simple and as summary as, with due regard to the rights of parties, it can be made. The great majority of the claims, which will be preferred in regard to lands to be constituted reserved forests, will be of a special kind, which can best be inquired into and settled on the spot; and will require that the officers charged with the duty shall be fully acquainted with the localities, as well as specially qualified to appreciate the nature, value, and bearings of the claims. For the decision of cases of this nature, arising as they will in remote and little frequented tracts, the procedure and constitution of the ordinary Courts are ill adapted; and were such cases brought in the ordinary Courts, there is little doubt that the Judges would be driven to appoint, for the investigation of them, Commissioners who would be less fitted for the task than the Forest Settlement Officers appointed by Government. Besides unsatisfactory enquiry, great delay would result. The nature of the settlement, which it is desired should be made, is also such as the ordinary tribunals are unfitted to carry out. It is desirable that in lieu (for example) of rights to pasture or fuel, which may be found to exist in tracts to be reserved, provision should be made for commutation by the grant of similar rights in other lands, or for the surrender of the rights in consideration of grants of land in other places. We have, therefore, entirely excluded the jurisdiction of the ordinary Courts in regard to (*a*) rights of way, (*b*) rights to water-courses or to use of water, (*c*) rights of pasture or to forest produce; and we have provided an appeal to the Collector, or Revenue Officer of like rank, from the decisions of the Forest Settlement Officer in regard to such rights.

14. In regard, however, to proprietary and occupancy rights in the land, as distinguished from rights of way, rights to water and to forest produce, we do not think that the jurisdiction of the Courts can be entirely excluded. In many cases such rights of property have been recognized, and will be evidenced by pattas or other titles, which will be at once admitted by the Forest Settlement Officer; and the boundaries will be demarcated on the ground. In other cases proprietary claims may be based on prescriptive enjoyment or on alleged exercise of acts

of ownership. When such claims are rejected by the Forest Settlement Officer we have allowed an appeal to the District Court, which will decide whether the claim should be admitted or not. In this respect, we have adopted a procedure different from that followed by the Indian Forest Act of 1878, and by the Burma Forest Act of 1881, both of which enactments provide for an appeal to a Revenue Officer in all cases. The allowance of an appeal to the District Court upon proprietary claims will, in some cases, cause delay, and this would be increased if a further appeal were in any case allowed from the decision of the District Court. We have, therefore, declared such decision as to the admission or rejection of the claim to be final. Cases of disputed boundaries between the reserved forest and private lands enclosed or adjoining, if they arise before the issue of the final notification, will resolve themselves into claims to property in land, and will be settled in the same manner and with like right of appeal. The Forest Settlement Officer is invested with the requisite powers to enter and survey. If, in cases appealed, the order of the District Court be in favor of the claimant, the Forest Settlement Officer will proceed to commute or settle it in like manner as if he had himself admitted it in the first instance.

15. The mode of settlement of claims admitted is provided in Sections 10, 11, 12, and 13 of the Bill, and may briefly be described to be commutation for money or land; grant of like rights in suitable land elsewhere; acquisition of the land under the Land Acquisition Act, it being provided that the compensation to be given may, with the consent of the claimant, be wholly or partly other than money-payment; or continuance of the right within the reserved forest, the conditions of its exercise being accurately defined and recorded. When all claims are finally disposed of and all proceedings taken in the manner provided, the Governor in Council may issue the notification under Section 16, declaring the forest to be reserved.

16. Some time will necessarily elapse between the first notification under Section 4 and the final notification under Section 16. During this period it is necessary to guard against fresh complications arising, and for this purpose the following provisions have been inserted :—

First—From the date of the original notification proposing to constitute certain lands a reserved forest, up to the date of the notification finally settling the limits of such reserved forest, no suits to establish rights in such lands shall be entertained by the Courts (Section 5). An express declaration to this effect seems necessary, as it is doubtful whether the mere establishment of a special tribunal ousts the jurisdiction of the ordinary Courts. The jurisdiction will, of course, revive in regard to lands not finally included in the notification constituting the reserved forest :

Second—From the date of the proclamation by the Forest Settlement Officer inviting claims, no fresh rights shall be acquired, except by succession or Government grant, over the land to which the inquiry extends, no clearings shall be made, and no pattas granted. It might be thought that the prohibition to grant pattas might be enforced by executive order, but, in practice, it has hitherto been found that even in land which had been declared a reserved forest by order of Government, pattas have through ignorance or otherwise been granted, and there has been difficulty about cancelling them. The Bill provides that they shall be void. Obviously it will be desirable that the interval between the original notification by Government and the Forest Settlement Officer's proclamation inviting claims should be as brief as possible, for in that interval there is nothing to prevent rights being acquired, clearings being made, and pattas being granted for the land included in the original notification, any of which events might seriously hamper the proceedings of the Forest Settlement Officer.

17. During the progress of his enquiry, the Forest Settlement Officer is empowered by Section 7 to allow, by order in writing, any act in the land with which he is dealing, which would otherwise be prohibited. This is an important safeguard, and it will be the duty of the Forest Settlement Officer to use this power freely, in order to prevent inconvenience to persons interested in the land proposed to be included in a reserved forest.

18. We have not in the Bill definitely laid down the official position of the Forest Settlement Officer in the district in which he may be working. From the nature of the powers given to him, he will, except that his orders may be appealed against in cases of ownership or of occupancy rights in land to the District Court, and in cases of other rights to the Collector, be more or less independent of the local authorities. But it will rest with Government, by rules made under the Act [Sections 13 and 69 (*b*)] to determine the relations of the Forest Settlement Officer to the Collector. Thus, when he grants rights in land, under Section 10 (iv) or 13, this ought, as a matter of course, not to be done without the Collector's concurrence. In fact, if such rights are granted by the Forest Settlement Officer, he should do so acting on behalf of, and under instructions from, the Collector.

19. It will be noticed that no definite powers of revision of the orders passed by the Forest Settlement Officer, or, on appeal, by the Collector, are given to Government by the Bill. The Indian and Burma Forest Acts contain provisions, giving the power of revision within five years from the final notification declaring the forest reserved. It appears to us that a clause to that effect in the present Bill might, in some cases, prevent a final settlement of the business, as it would act as an inducement to disappointed claimants to appeal from the Court or the

Collector to the Government, and hence no such provision has been inserted. It is, however, open to the Government to lay down such rules for the guidance of the Forest Settlement Officer in the conduct of his enquiry and for the reporting of his proceedings to the Collector, the Board of Revenue or other authority, as will ensure adequate supervision.

20. In ordinary cases, such as involve no intricate enquiry, and the disposal of which presents no difficulty, the Forest Settlement Officer may be trusted to decide, subject to the appeals prescribed, without reference to higher authority. But, in important and difficult cases he should, after all appeals have been disposed of, obtain the sanction of Government to the settlement, before the final notification under Section 16 is issued. The issue of that notification should finally close the proceedings. In order to attain this object, it will be preferable to incur such delay as may be necessary to obtain the final sanction of Government to the Forest Settlement Officer's proposals, rather than, as is done by the Indian and Burma Acts, to leave it open to persons who may think themselves aggrieved to revive, at any time within five years after the notification, questions on which they ought to have obtained a final decision at the original enquiry, or by appeal as prescribed. It is always open to Government, by rules made under Section 21, to allow any act in a reserved forest, which would otherwise be penal. And Section 24 empowers Government, with the previous sanction of the Governor-General in Council, to disestablish any reserved forest or portion of a reserved forest.

21. It will now be necessary to explain the legal consequences which will follow upon the issue of the final notification. Section 18 prevents rights being acquired in reserved forests otherwise than by succession, or under written grant or contract; and guards against alienation of lands in such forests on patta tenure. Section 19 renders void the alienation of rights recognised in reserved forests, save with the estate to which they appertain, or otherwise with the sanction of Government. Section 20 gives power to alter paths and water-courses in reserved forests, provided due provision is made for the convenience of all persons by whom such paths and water-courses are used. Penalties for trespass and acts of damage in a reserved forest are provided in Section 21; and under Section 22, when such forest is injured by fire caused wilfully or negligently, the exercise of rights of pasture or to forest produce continued therein may be suspended for a period not exceeding twenty years. Lastly, the duty of giving assistance in the protection of reserved forests, by furnishing information in regard to offences, and by preventing or extinguishing fires, is imposed by Section 23 on persons who have the use of the produce of such forests, and on village officers and other public functionaries in the vicinity.

These are the provisions applying to lands which have been constituted reserved forests under the Act.

22. The last matter of importance in connection with reserved forests is the question whether the reserves which have already been formed under the orders of Government are to be considered as reserved forests under the Act. We have provided that the Governor in Council may declare them to be so, if he is satisfied that the rights of Government and of private persons, in or over the lands, have been enquired into, settled and recorded in a sufficient manner. The point for decision in this matter is whether the enquiry held previous to the constitution of each reserve was sufficient to be accepted as equivalent to an inquiry held under the Act, and this question must, in each case, be decided by Government. This is proposed to be enacted by Section 25. After the Bill has become law, we would suggest that it be made the duty of one of the Settlement Officers, to be appointed under the Act, to examine, in company with the Conservator, the records regarding each of these reserved forests and to submit proposals regarding them to the Government.

Protection of Land at the disposal of Government not included in Reserved Forests.

23. In regard to lands at the disposal of Government outside reserved forests, the conservancy of which is provided for in Chapter III, we think that no definition or restriction of the rights exercised by the people is expedient or possible, and that it is desirable expressly to declare that nothing of the kind is contemplated. Accordingly, in Section 34 it is provided that nothing in this chapter or any rule made under it shall abridge or affect existing rights of individuals or communities. In the interests of conservancy, which in the long run will coincide with those of the right-holders, it is necessary that they shall submit to regulation; but we wish it to be clearly understood that interference with the rights and privileges enjoyed by the people is not intended.

24. We do not desire to restrict generally the continued extension of cultivation in order to increase the forest area, but it is certain that in all districts there is a considerable extent of land which is not wanted for cultivation, and which contains forest growth or is suitable for conversion into woodland. We think that such lands should be set apart for forest purposes, and we, therefore, propose to constitute a category of reserved land which will, under Section 26, be protected by distinct legislative declaration from alienation on patta, but which may, if temporary occupation of it for cultivation is unobjectionable, be made available for that purpose under one-year leases (Section 28). The selection and settlement of the reserved forests will take a long time, and cannot be even begun in many districts for some years. Many of the lands which will now be declared reserved will probably hereafter, when the work of forest

settlement is more advanced, be taken up and constituted reserved forests; and, in order to prevent difficulties as well as expense in the eventual settlement of these lands, it is necessary to take at once security against their being alienated carelessly or of design. There are also large extents of waste land which should be retained mainly with the view of securing a larger and more certain supply of pasture, chiefly during seasons of drought. In order to improve the productiveness of these lands efforts will be made to increase the growth of trees and shrubs upon them, and the first step towards their protection and improvement must obviously be to guard against their alienation. The question what portion of such areas will eventually be constituted reserved forests must be left for future consideration. Penalties for unauthorised clearing or cultivation in reserved land are provided in Section 33.

25. The selection of reserved lands will not, we think, as a rule, be a work of much difficulty, and can be accomplished in a short space of time by the local Revenue and Forest establishments working in concert. The lists of reserved lands will be scrutinised by the Board of Revenue, whose duty it will be to see that reservation is not carried to an extent prejudicial to the growth of cultivation where it is desirable to encourage its spread. The extent reserved will probably not be a large proportion of the waste in most districts, and will vary much with reference to the degree in which the district is well or ill supplied with forest, or requires special provision to secure sufficient pasture during seasons of drought. In districts like Bellary, Anantapur, and parts of Coimbatore, where the country has become much denuded, and where the necessity of restoring forest growth is urgent, it will be advisable to set apart a large proportion of the waste land at the disposal of Government. In other districts less will be required.

26. Though the existing user of pasture and forest produce in the areas outside reserved forests is as above stated to be allowed to continue, wherever such user is based upon an actual right, powers must be taken for regulating pasture and the use of forest produce whenever the interests of forest conservancy require such restriction. The circumstances of different parts of the country are so various that rules necessary in one place may be of no value or oppressive in another; and all that can, as we think, be attempted in a Forest Act is to specify certain matters which may have to be dealt with, and to give Government power to make rules in respect of such matters, to be applied in the several districts or parts of districts as may be found necessary. The matters specified are briefly cultivation, fires, felling, quarrying, burning lime or charcoal, cutting grass and grazing cattle, hunting and shooting, sale or free grant of timber or other natural produce, scales of fees and other payments and mode of levying them. The rules will take the place of the existing Forest and Jungle Conservancy Rules, ordinary and special, and in many points the rules framed under the Act for the different districts will no doubt be similar. But we desire to reiterate our opinion that elasticity in the system of conservancy of the lands not included in reserved forests, should be aimed at as far as possible, and that, in framing the rules, full allowance should be made for diversity of local circumstances. Under the last clause of Section 29, Government is empowered to attach penalties within a maximum of one month's imprisonment and two hundred rupees fine to breaches of the rules made under this section.

27. The enactment of rules having the force of law and carrying penalties clearly renders it necessary that the areas within which the rules are to apply shall be defined, and that such loose expressions as "waste," "scrub-jungle," "unreserved forests," &c., which occur in the existing rules should not be used. The policy which, in our opinion, should be followed in this respect is to frame strong and efficient conservancy rules and to restrict their application, and the attention of the officers who are to administer these rules to lands in which there is forest growth worth protection or in which operations for creating it are, or will eventually be, undertaken. From what we have said above, it will be seen that we assume that all reserved land will be of this character; and for this reason we have provided in Section 30 that the conservancy rules shall of necessity apply to all such lands. When the rules are wanted for conservancy in other lands, the Collector is empowered, subject to the sanction of Government, to extend their application. What we desire is to guard against an indiscriminate and hasty extension of the rules to all waste lands, as we believe that such a measure is unnecessary, and would be very oppressive to the people as well as inconvenient in the revenue administration; and we hope to secure our object by leaving it to the Collector, who possesses local knowledge, to take the initiative, and to make these rules applicable where they are wanted. By Section 31 we propose to empower Government to close against pasture, for a period not exceeding twenty years, any lands to which the rules made under Section 29 have been extended, whenever fire has been caused wilfully or negligently, provided arrangements have been made to meet the requirements of people who may have rights of pasture.

28. The Bill (Section 32) also deals with the question of reserved trees, and this section will have operation in all lands at the disposal of Government other than reserved forest, and will protect such trees against felling or damage otherwise than under rule or special authorisation. The protection hitherto accorded to reserved trees has been very beneficial; but it has been found that the measure can only be effectual and practically useful when the number of reserved kinds is limited. There can be no doubt as to the expediency of thus protecting teak, sandalwood, and red sanders; and local protection accorded to some other kinds, for

example to yepi (*Hardwickia binata*) in Bellary, has been attended with good results. On the other hand, where the reserved list includes, as in South Arcot, as many as 33 kinds, the provision becomes unworkable. In pursuance of these views, the Bill declares teak, sandalwood, and red sanders to be reserved trees on all lands at the disposal of Government throughout the presidency, and empowers Government to declare other kinds in particular districts to be also reserved. A penalty has been provided for cutting reserved trees otherwise than in accordance with rule.

Protection of Land not at the disposal of Government or in which Government has a limited interest.

29. In Chapter IV of the Bill we have brought together the provisions which we deem it necessary should be enacted regarding interference with private forests. The question of the extent and conditions of such interference is one of the most difficult which has to be dealt with. Interference cannot be avoided altogether, for there are many private forests, the preservation of which is as important to the public interest as is that of forests belonging to Government, but which, through the negligence or ignorance of the owners, are not protected and are in danger of destruction. In some parts of the country the existence of agricultural prosperity depends on the maintenance of the water-supply in rivers used for irrigation which take their rise in, and are nourished by, forests belonging to private owners; and in such cases private interest must give way in order that measures, necessary to the public welfare, may be taken for the preservation of the forests. There are other cases in which private and State forest lands are so intermingled that the absence of protective measures in the private forests makes it all but impossible to prevent danger and injury to those belonging to the State, and in which, on such grounds, it is legitimate to apply compulsion to the proprietors. We have, therefore, proposed to authorise interference with private proprietors when such is necessary to ensure the protection of river sources or to avoid danger to the State forests; but we have also endeavoured to keep in view the principle that the interference of Government should be limited to the measures which are necessary, and will be most efficacious, and at the same time least burdensome to the private owners.

30. The greatest dangers to which forests are exposed are excessive felling and fires. There is no doubt that indiscriminate clearing and cutting do quite as much damage as fires; but we nevertheless, for the reasons stated below, propose that interference shall be restricted to the enforcement of measures against the latter only, and should not be authorised when destruction of forest through excessive felling appears imminent. We are aware that we thus attack only one of the two evils which have gone so far to ruin the forests of the Presidency, and that as regards river protection we shall only partially secure our object. But the difficulties in the way interfering with felling timber in private forests for sale are very great. The clearing of forest, either for cultivation or for sale of timber, always yields large immediate profits, which would be annihilated or much reduced if the felling were brought under regulation; and for the loss of these profits compensation would have to be given We do not see our way to framing satisfactory provisions for the adjustment of such compensation. The amount demanded would be exorbitant; and if interference with felling is to be undertaken, we fear that Government will be driven to accept procedure under the Land Acquisition Act, in view to taking up the forest altogether. The cost of acquisition would be so great that Government would be unable to interfere even in the most necessary cases; and from too much having been attempted in the Act, it would probably fail to provide any remedy at all.

31. Further, on the hill ranges for which the provisions of this chapter are especially designed, viz., those in the Tinnevelly, Madura, and Coimbatore Districts, the forests, as a matter of fact, suffer more from annual fires than from excessive felling. On the other hand, if the action of Government is limited to protection against fire, the proprietor only suffers a slight and temporary loss; while the protection thus afforded will greatly improve the condition of the forest. The fires which are lighted in the hot weather in the grass lands scattered through the forests, in order to produce fresh cattle fodder, or which are kindled by the hill tribes when burning the jungles for cultivation, cause enormous damage. The evergreen forests are eaten into and gradually reduced, and the deciduous forests are either destroyed or kept in a stunted condition; but when a poor open forest is continuously protected against fire its condition improves rapidly. Protection against fire has an equally beneficial effect on pasturage when continued sufficiently long. The coarser kinds of grass, which alone can maintain their existence under the annual fires, are gradually displaced by the finer and more tender species. At first the proprietor may suffer a slight loss, but this will soon be made up and a larger permanent income will be secured to him.

32. For the reasons above stated we have limited the power of interference with private lands to cases when it appears necessary to enforce protection against fire. In such cases Government will, after full inquiry into the objections made by persons interested, issue a notification declaring the lands subject to the provisions of the Act in this respect, and thereupon the Collector will issue to the proprietor such orders regulating or prohibiting the firing of grass, trees or timber as may be necessary for the object in view. The orders to be issued will ordinarily relate to the following points :—

(1) The firing of the grass and leaves for pasture and for any other purpose, save clearing and burning the forest for cultivation, will be prohibited, except with the special permission of the Collector;
(2) Persons who intend to clear or burn grass or forest for culivation must give notice of at least one week of their intended firing;
(3) They must clear a fire-trace all round the clearing, and they must prevent the fire from crossing the trace;
(4) They must not burn during high winds;
(5) Such fire-traces along roads and otherwise must be cleared as may be prescribed by the Collector;
(6) During certain seasons, the lighting of camp fires, the burning of charcoal, and the lighting of fires generally in forest of grass land except at places appointed by the Collector, will be prohibited, as well as the carrying of fire without permission through grass land or forest.

33. The only possible penalty or remedy for neglect or disobedience of these orders is to place the forests in question under the control of Government officers. But, under the Bill, this penalty will not be enforced until it has become clear that the necessary measures towards fire-protection will not be adopted by the private proprietor; and the management will be continued only so long as is necessary to show to all concerned that it is possible to protect forest and grass lands from fire, and until such progress towards that end has been made by organising the system and by improving the condition of the forest, that the continuance of the work can be left to the proprietor.

34. It is only after neglect or disobedience of the orders given, repeated after fresh notice, that the Collector will have power to assume control of the land and to arrange for its management. There is no danger that this will be done in consequence of mere petty neglect or accident, and the proprietor will have ample time and opportunity to carry out the necessary protective measures if he is able and willing to do so. When management is once assumed the officer placed in charge of the land will, under the provisions proposed in the Bill, have full power to regulate felling as well as to do all things necessary for the proper administration of the land. The management is to be continued for at least ten years, the shortest period in which the beneficial results of the measures taken can become manifest. After the expiry of this period the Government will have power to continue the management, if necessary, or to restore the forest to the owner. It is proposed that an account of receipts and charges shall be furnished at the end of each year to the proprietor of the forest, and that each year's surplus shall be paid to him without delay. He is at liberty to object to any item in the account furnished, but the decision of Government on such objection is to be final.

35. An important but necessary provision is, that if the operations of any year result in an excess of charges over receipts, such excess will be paid by Government. In some cases this may occasion heavy outlay, but such outlay will be well spent for the protection of the country against drought. It is the price paid by Government for maintaining a regular water-supply in the rivers which drain the forests placed under protection.

36. In these provisions every possible consideration has been shown to the proprietor. It is only on his proved incapacity or default in the management of his property that Government steps in to prevent serious injury to public interests; the interference is continued no longer than is absolutely necessary, and the arrangement is such that while the proprietor will have the profit, the loss of the management will fall on Government. If the provisions, as here proposed, are accepted and pass into law, and if these provisions are worked in an intelligent and considerate manner, the practical result will probably be that many of the forests, the protection of which is required in the interests of the country, will be managed by Government officers, under arrangements which will give satisfaction to the proprietor. He will not lose his hold on the land, but the land will be managed for him in such a manner as to yield a permanent income larger than he could expect to realise by any other arrangement.

37. The most important instances in which interference with private lands is necessary will be found in the ghât forests of the Coimbatore, Madura, and Tinnevelly Districts. There will be no need to apply this portion of the law to the District of South Canara, and to the main portion of Malabar, where the rivers run to the westward, and are not used for irrigation, and it is doubtful whether it will be expedient to apply them to the Nílgiri District and to Wynaad. The head waters of the Cubbany are in Wynaad, and those of several feeders of the Bhaváni are on the Nílgiris. As feeders of the Cauvery, both rivers are important for the irrigation, chiefly of the Trichinopoly and Tanjore Districts. But the Cauvery is a large river, draining a considerable length of the Western Ghâts, and a deterioration of the water-supply in some of its feeders will be felt less in this case than in the case of the smaller rivers in Coimbatore, Madura, and Tinnevelly. Hence the exclusion of the Wynaad and the Nílgiris from the operation of these sections might be considered, and there would seem to be a special reason for excluding them. Private enterprise has taken firm hold in the Nílgiris and in Wynaad, and any action of Government which might appear to interfere with the development of the plantations and private enterprise generally in those localities should be avoided. On these grounds the exemption of the Nílgiris, Malabar, and South Canara from the operation of

the sections under discussion would seem to be justified; and this can be done under the clause of Section 1, which empowers Government to exempt any place from the operation of any portion of the Act.

38. Section 41 provides for the assumption by Government of the management of private forests at the request of the owners, or the application to them of any of the provisions of the Act. This will make it possible to extend conservancy rules to private forests and jungles, and will much strengthen the hands of the proprietors in any measures of conservancy they may adopt. It is hoped that when they see the benefits which will result from improved forest administration, they will largely avail themselves of the provisions of this section. Section 42 enables Government to ensure proper conservancy in cases where private persons are jointly interested with Government in any forest or waste land. This section is taken from the Indian Forest Act.

39. By Section 43 it has been provided that persons employed to carry out the provisions of the Act, when applied either to the lands of private proprietors or to lands in which Government and private proprietors are jointly interested shall be regarded as "Forest Officers." This provision will be of great use in the protection of lands under this chapter. When the persons employed to carry out the Act are Government servants or are appointed by the Collector, its application will present no difficulty. When private proprietors have, under Section 41, obtained the protection of the Act, and for enforcing it employ their own servants, it will be for Government to decide whether such persons ought to exercise all powers conferred by the Act upon Forest Officers. Government may, under Section 69, declare by what Forest Officers the powers or duties conferred or imposed by the Act shall be exercised, and can therefore prescribe for instance, that watchers employed by a shrotriemdar or other private proprietor to guard his jungle against fire, or damage by cattle, or theft of timber or forest produce, may impound cattle trespassing in the forest under Section 63, but may not seize property under Section 47 or arrest without warrant under Section 57.

Control of Timber in Transit.

40. The object of Chapter V is to provide for the control of timber in transit, whether by land or water. Government may make rules under Section 45 if there is reason for doing so, which will enable Forest Officers to protect Government timber in transit and to guard against timber, the produce of Government forests, being fraudulently exported, as if it were the produce of private forests. The rules are intended to prescribe routes for the import into, and export of timber from, the Presidency, and to provide that timber, whether brought from Government or from private forests, shall be covered by passes either from public officers or the owners of private forests; and shall be brought to certain stations for examination and marking.

41. It will be noticed that the section is permissive, that is, rules may or may not be made under it by Government, and that it has been left open for Government to restrict the application of such rules as may be made to certain classes of timber or to certain defined local limits. Had all the reserved forests which it may be desirable to constitute been already formed, it might be possible to make the rules applicable to those forests alone, and to allow timber obtained elsewhere to be transported without examination; but considering that the reservation of forests has hitherto made but slight progress in the Presidency, it seems necessary, in the interests of the protection of the forests, that power to make rules, such as those indicated in Section 45, should be taken.

42. Much of the forest revenue in some districts is now derived from the issue of licenses to cut timber and firewood in undemarcated jungles, and without a system of stations for the examination of this timber and firewood in transit this revenue could not be secured. The rules which it is proposed to make for the protection of rivers and their banks (clauses h, i, j) will, it is believed, be found useful in the District of Malabar, where the rivers are largely used for floating timber. The provision for regulating the use and registration of property-marks for timber is intended to protect the timber trade generally wherever logs are floated singly, and are liable to be appropriated by dishonest persons. Penalties have been provided for breach of the rules and double penalties for persons who offend in the night or who resist the law or are more than once convicted of a similar offence against the rules. This latter provision is adopted from the Indian and Burma Acts, and is believed to be necessary.

Penalties and Procedure.

43. Chapter VI deals with penalties and procedure. Its provisions are, for the most part, supplementary to those of the Code of Criminal Procedure and the Indian Penal Code. It is provided that any instruments or cattle used in the commission of a forest offence as well as the property in respect of which it is committed are liable to seizure (Section 47) and confiscation (Section 49). The Magistrate ordering confiscation will (Sections 50 and 51) either after trying the offender, or, when he is unknown, after public notice inviting claims, deliver the property to the Forest Officer in charge of the case, who (Section 53) after the expiry of the period

allowed for appeal or the presentation of claims will deal with the property confiscated as though it belonged to Government. The District Forest Officer may (Section 55) withdraw any charge and release the property seized, and any Forest Officer, if empowered by Government to do so, may compound forest offences out of Court. This latter provision will, in practice, be most useful, and by saving offenders from the disgrace and trouble of appearing in Court will make it easier to enforce the Act. As a matter of course, this power should be granted with caution, and should only be given to officers of the superior staff, which may be done under Section 65(*e*).

44. By Section 57 it is proposed to invest Forest Officers and Police Officers, subject to punishment (Section 58) in case of abuse, with power to arrest without warrant persons who in their view commit forest offences or who are found in suspicious circumstances in reserved forests or on land the forest growth on which is protected by rules made under Section 29. The Indian Forest Act allows the arrest without warrant in any place of any person who is reasonably suspected of having committed a forest offence. The power to arrest without warrant is necessary, because in forest offences, from the position of the forests in remote localities and from the absence of witnesses, identification of offenders is extremely difficult and *alibi* may often be successfully pleaded. We have somewhat deviated from the Indian and Burma Acts by requiring officers making arrests at once to take or send the offender to the nearest police station, which will generally be within easy reach, instead of to the Magistrate who may be at a distance. The station officer will deal with the offender according to law. While sufficiently providing for the liberty of the subject, the provisions here made will facilitate the bringing of offenders to justice. Section 62 which directs that any forest produce, as to the ownership of which there is a dispute, shall be deemed the property of Government till the contrary is proved, has been adopted from the Indian and Burma Forest Acts.

45. Section 56 prescribes penalties for counterfeiting or defacing marks on timber or standing trees, and for altering boundary marks. This provision will be found useful wherever the custom obtains to mark timber sold at large depôts with the sale-mark, and to mark trees sold standing in the forest. Some of the offences which it is intended to punish under this section are punishable under the Indian Penal Code, but they are not specifically named in that code. Under Section 60 there will be no difficulty in dealing with this or any other class of forest offences under the Penal Code or any other law whenever it may be desirable to use those provisions instead of those of the Forest Act.

Here we wish to note with regard to the penal clauses generally that we have advisedly allowed either imprisonment or fine, instead of making fine the substantive and imprisonment only an alternative punishment. We consider that in the case of many offenders under the Act, who will belong to the poorest classes, imprisonment for a short period will be a more suitable and more humane punishment than a fine which may lead to the offenders being stripped of all his property and ruined.

Cattle-trespass.

46. Chapter VII extends the provisions of the Cattle-trespass Act to reserved forests and to lands on which grazing may be prohibited by rules made under Section 29, and enables Government to prescribe higher rates of fines than those laid down in that Act, sufficient to protect the forest growth on such lands from damage.

Forest Officers.

47. Chapter VIII deals with Forest Officers, and lays down that they are public servants within the meaning of the Indian Penal Code (Section 66), that public servants may not be sued or prosecuted for acts done by them in good faith under the Act (Section 67), and that Forest Officers may not trade (Section 68). In order to carry out the provisions of the Act certain powers have, in various sections, been given to Forest Officers, and certain special powers have been given to the "District Forest Officer," who, under the Collector, will be the chief Forest Officer in a district or portion of a district. By Section 65, Government is empowered to invest Forest Officers with power to act under the Madras Boundaries Act, to compel the attendance of witnesses, to issue search warrants and to hold enquiries into forest offences and in the course of such enquiries to receive and record evidence.

Miscellaneous.

48. The provisions of Chapter IX are of a miscellaneous nature. Government is empowered by Section 69 to make such rules (in addition to those made under other sections) as may be required to carry out the Act. All rules are to be published in the *Fort St. George Gazette*, upon which they obtain the force of law. By Section 71 Government may delegate to the Board of Revenue or other controlling Revenue authority such of the powers given by the Act as do not involve the prescription of penalties. Under Section 72 money due to Government under the Act, expenses incurred in working the Act, for example in carrying out Section

45(*i*), and compensation due to Government will be recovered by the same procedure as that by which land revenue is collected, and under Section 73, any money due to Government will be a first charge on the forest produce on account of which it may be due. The last section (74) provides that land required for the purposes of the Act shall be deemed to be needed for a public purpose within the meaning of Section 4 of the Land Acquisition Act.

P. O'SULLIVAN, *Advocate-General.*
E. FORSTER WEBSTER, *Ag. Secy. to Govt., Rev. Dept.*
W. S. WHITESIDE, *Collector of North Arcot.*
W. LOGAN, *Collector of Malabar.*
H. E. STOKES, *Collector of Salem.*
D. BRANDIS, *Inspector-General of Forests, on special duty.*
J. CAMPBELL-WALKER, Major, *Conservator of Forests.*

Memorandum by the Hon. P. O'SULLIVAN, dated Ootacamund, the 10th June 1882.

I think the local Council has not power to pass Section 62 of the Bill. The section establishes a presumption, which is contrary to the Evidence Act, 1872, passed by the Governor-General's Council, and therefore probably not within the competency of the local Council under Section 42 of the Indian Council's Act, 24 and 25 Vic., Chapter 67.

2. Section 61 of the bill may be passed, provided the sanction of the Governor-General is obtained under Section 43 of the Indian Council's Act; the effect of the section being to amend the Penal Code with respect to the compounding of offences.

3. As the Bill is to be sent to the Government of India before it is introduced into the local Council, it would, I think, be desirable to call attention to the power of arrest without warrant given in Section 57.

4. The provision in Section 10 (iv) providing that the Forest Settlement Officer and Court proceeding under the Land Acquisition Act, 1870, may award compensation by the grant of rights in or over land seems to be contrary to the Land Acquisition Act, which authorises money compensation only, and it is therefore questionable whether the provision should be retained.

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A BILL TO MAKE PROVISION FOR THE PROTECTION AND MANAGEMENT OF FORESTS IN THE PRESIDENCY OF MADRAS.

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A BILL TO MAKE PROVISION FOR THE PROTECTION AND MANAGEMENT OF FORESTS IN THE PRESIDENCY OF MADRAS.

Preamble.

WHEREAS it is expedient to make provision for the protection and management of forests in the Presidency of Madras; It is hereby enacted as follows :—

CHAPTER I.

Preliminary.

Burma Forest Act, Section 1. Indian Forest Act, Section 1.

Short title.

1. This Act may be called "The Madras Forest Act, 1882."

Local extent.

It extends to all territories for the time being subject to the Government of Fort St. George, provided that the Governor in Council may, by Notification in the *Fort St. George Gazette*, exempt any place from the operation of the whole or any portion of this Act, but not so as to affect any thing done, or any offence committed, or any fine or penalty incurred, or any proceedings commenced in such place before such exemption, and may in like manner vary or cancel such Notification;

Commencement.

and it shall come into force on such day as the Governor in Council may, by Notification in the *Fort St. George Gazette*, direct.

Burma Forest Act, Section 3. Indian Forest Act, Section 2.

Interpretation clause.

2. In this Act, and in all Rules made hereunder, unless there is something repugnant in the subject or context,—

"Government:"

"Government" means the Governor of Fort St. George in Council:

"Collector:"

"Collector" means the chief executive Revenue Officer of a district:

"Forest Officer:"

"Forest Officer" means any person appointed by name or as holding an office by or under the orders of the Government to be—

a Conservator, Deputy Conservator, Assistant Conservator, Sub-Assistant Conservator, Forest Ranger, Forester, Forest Guard;

or to discharge any function of a Forest Officer under this Act or any rule made hereunder:

"District Forest Officer:"

"District Forest Officer" means the chief Forest Officer of a district or of a portion of a district, if in independent charge of such portion:

"tree:"

"Tree" includes stumps, bamboos, and brushwood:

"timber:"

"Timber" includes trees when they have fallen or have been felled, and all wood, whether cut up or fashioned or hollowed out for any purpose or not:

"forest produce:"

"Forest produce" includes the following things when found in, or brought from, a forest (that is to say):—

minerals (including limestone and laterite), surface-soil, trees, timber, plants, grass, peat, canes, creepers, reeds, fibres, leaves, moss, flowers, fruits, seeds, roots, galls, spices, juice, catechu, bark, caoutchouc, gum, wood-oil, resin, varnish, lac, charcoal, honey and wax, skins, tusks, bones and horns:

"forest offence:"

"Forest offence" means an offence punishable under this Act or any rule made hereunder:

"cattle:"

"Cattle" includes elephants, camels, buffaloes, horses, mares, ponies, colts, fillies, mules, asses, pigs, rams, ewes, sheep, lambs, goats, and kinds:

"river:"

"River" includes streams, canals, creeks and other channels, natural or artificial:

"land at the disposal of Government:"

"Land at the disposal of Government" includes all unoccupied land, whether assessed or unassessed; but does not include land the property of landholders as defined by Section 1 of Act VIII of 1865, Madras:

"Magistrate:"

"Magistrate" means a Magistrate of the first or second class and includes a Magistrate of the third class when he is specially empowered by Government to try forest offences:

"imprisonment."

"Imprisonment" means imprisonment of either description, as defined in the Indian Penal Code.

NOTE.—The marginal references indicate the corresponding sections of the Indian Forest Act, 1878, the Burma Forest Act, 1881, and in some cases the Government Forests Act, 1865. The reference placed first is that of which the wording most nearly agrees with the present Bill.

CHAPTER II.

Reserved Forests.

Power to reserve forests.

3. The Governor in Council may constitute any land at the disposal of Government a reserved forest in the manner hereinafter provided. Burma Forest Act, Section 5. Indian Forest Act, Section 3.

Notification by the Governor in Council.

4. Whenever it is proposed to constitute any land a reserved forest, the Governor in Council shall publish a Notification in the *Fort St. George Gazette*— Burma Forest Act, Section 6. Indian Forest Act, Section 4.

(*a*) specifying as nearly as possible the situation and limits of such land;

(*b*) declaring that it is proposed to constitute such land a reserved forest;

(*c*) appointing an officer (hereinafter called "the Forest Settlement Officer") to enquire into and determine the existence, nature, and extent of any rights claimed by, or alleged to exist in favor of, any person in or over any land comprised within such limits, or to any forest produce of such land and to deal with the same as provided in this chapter.

The officer appointed under clause (*c*) of this section shall ordinarily be a person other than a Forest Officer; but a Forest Officer may be appointed by the Governor in Council to attend on behalf of Government at the enquiry prescribed by this chapter.

Suits barred.

5. Except as hereinafter provided, no Civil Court shall, between the dates of the publication of the Notification under Section four and of the Notification to be issued under Section sixteen, entertain any suit to establish any right in or over any land, or to the forest produce of any land included in the Notification published under Section four. New.

Proclamation by Forest Settlement Officer.

6. When a Notification has been issued under Section four, the Forest Settlement Officer shall publish in the official gazette of the district, and at the headquarters of each taluk in which any portion of the land included in such Notification is situate, and in every town and village in the neighbourhood of such land, a Proclamation— Burma Forest Act, Section 7. Indian Forest Act, Section 6.

(*a*) specifying as nearly as possible the situation and limits of the land proposed to be included within the reserved forest;

(*b*) setting forth the substance of the provisions of Section seven;

(*c*) explaining the consequences which, as hereinafter provided, will ensue on the reservation of such forest; and,

(*d*) fixing a period of not less than three months from the date of publishing such Proclamation in the official gazette of the district and requiring every person claiming any right referred to in Section four, either to present to such officer within such period a written notice specifying, or to appear before him within such period and state the nature of such right and in either case to produce all documents in support thereof.

The Forest Settlement Officer shall also serve a notice to the same effect on every known or reputed owner or occupier of any land included in or adjoining the land proposed to be constituted a reserved forest, or on his recognized agent or manager. Such notice may be sent by post to persons residing beyond the limits of the district in which such land is situate.

Bar of accrual of forest rights.

7. During the interval between the publication of such Proclamation and the date fixed by the Notification under Section sixteen no right shall be acquired in or over the land included in such Proclamation, except by succession or under a grant or contract in writing made or entered into by, or on behalf of, the Government or some person in whom such right, or power to create the same, was vested when the Proclamation was published; and no fresh clearings for cultivation or for any other purpose shall be made on such land. No patta shall be granted on behalf of Government in such land, and any patta so granted shall be null and void. Burma Forest Act, Section 8. Indian Forest Act, Section 5.

Prohibition of clearings, &c.

Nothing in this section shall be deemed to prohibit any act done with the permission in writing of the Forest Settlement Officer.

Enquiry by Forest Settlement Officer.

8. The Forest Settlement Officer shall take down in writing all statements made under Section six, and shall enquire into all claims made under that section, recording the evidence in such manner as the Government may from time to time prescribe. The Forest Settlement Officer shall at the same time consider and record any objection which the Forest Officer (if any) appointed under Section four may make to any such claim. Burma Forest Act, Section 9. Indian Forest Act, Section 7.

Indian Forest Act, Section 8. Burma Forest Act, Section 10.

Powers of Forest Settlement Officer.

9. For the purpose of such enquiry, the Forest Settlement Officer may exercise the following powers (that is to say)—

(*a*) power to enter, by himself or any officer authorized by him for the purpose, upon any land, and to survey, demarcate and make a map of the same; and,

(*b*) the powers conferred on a Civil Court by the Code of Civil Procedure for compelling the attendance of witnesses and the production of documents.

Burma Forest Act, Section 12. Indian Forest Act, Section 10.

Claims to rights of occupancy and ownership.

10. In the case of a claim to a right in or over any land other than the following rights:—

(*a*) a right of way;
(*b*) a right to a water-course, or to use of water;
(*c*) a right of pasture, or to forest produce;

the Forest Settlement Officer shall pass an order specifying the particulars of such claim and admitting or rejecting the same wholly or in part.

Admitted claims.

If such claim is admitted wholly or in part, the Forest Settlement Officer may (1) come to an agreement with the claimant for the surrender of the right; or (2) exclude the Land from the limits of the proposed forest; or (3) proceed to acquire such land in the manner provided by the Land Acquisition Act, 1870.

For the purpose of so acquiring such land—

(i) the Forest Settlement Officer shall be deemed to be a Collector proceeding under the Land Acquisition Act, 1870;
(ii) the claimant shall be deemed to be a person interested and appearing before him in pursuance of a notice given under Section nine of that Act;
(iii) the provisions of the preceding sections of that Act shall be deemed to have been complied with; and
(iv) the Forest Settlement Officer with the consent of the claimant, or the Court with the consent of the claimant and the Collector of the district may award compensation by the grant of rights in or over land, or by the payment of money or both.

Rejected claims—Appeals.

If such claim is rejected wholly or in part, the claimant may, within sixty days from the date of the order, prefer an appeal to the District Court in respect of such rejection only. If the District Court decide that the claim or such part thereof as has been rejected should be admitted, the Forest Settlement Officer shall proceed to deal with it in like manner as if it had been in the first instance admitted by himself.

When a claim has been admitted in the first instance wholly or in part, a like appeal may be preferred on behalf of Government by the Forest Officer appointed under Section four, or other person generally or specially empowered by the Government in this behalf.

The order of the District Court on appeals under this section shall in all cases be final.

Burma Forest Act, Section 13. Indian Forest Act, Sections 11 and 12.

Claims to rights of way, water course, pasture, and to forest-produce.

11. In the case of a claim to rights of the kind specified in clauses (*a*), (*b*), and (*c*) of Section ten the Forest Settlement Officer shall pass an order specifying the particulars of such claim as far as may be necessary to define the nature, incidents, and extent of the rights claimed, and admitting or rejecting such claim wholly or in part.

When a claim to any such right is admitted, if the right is for the beneficial enjoyment of any land or buildings, he shall record the designation, position, and area of such land, and the designation and position of such buildings.

Where the right is a right to forest produce, he shall also record whether the forest produce obtained by the exercise of such right may be sold or bartered.

Burma Forest Act, Section 14. Indian Forest Act, Section 14.

Provision for rights of pasture or to forest produce admitted.

12. When the Forest Settlement Officer has admitted wholly or in part, and recorded under Section eleven, a claim to a right of pasture or to forest produce, he shall as far as possible provide for the exercise of such right—

(*a*) by altering the limits of the proposed reserved forest so as to exclude land of sufficient extent, of a suitable kind, and in a locality reasonably convenient for the purposes of the claimant:
(*b*) by recording an order continuing to the claimant a right of pasture or to forest produce (as the case may be), subject to such rules as may be prescribed by the Governor in Council.

The order passed under clause (*b*) shall record, as far as practicable, the number and description of the cattle which the claimant is from time to time entitled to graze, the local limits within which, and the seasons during which, such pasture is permitted; or

the quantity of timber or other forest produce which the claimant is authorized to take or receive, the local limits within which, the season during which, and the mode in which, the taking of such produce is permitted; and

such other particulars as may be required in order to define the extent of the right which is continued, and the mode in which it may be exercised.

Commutation of such rights.

13. Whenever any right of pasture or to forest produce admitted under Section eleven is not provided for in one of the ways prescribed in Section twelve, the Forest Settlement Officer shall, subject to such rules as the Government may prescribe in this behalf, commute such right by paying a sum of money in lieu thereof, or, with the consent of the claimant, by the grant of rights in or over land or in such other manner as such officer thinks fit. Burma Forest Act, Section 15. Indian Forest Act, Section 15.

Appeal from order passed under foregoing sections.

14. The claimant or the Forest Officer appointed under Section four, or any other person generally or specially empowered by the Government in this behalf may, within sixty days from the date of any order passed by the Forest Settlement Officer under Sections eleven, twelve, and thirteen present an appeal from such order to the Collector or to such Officer of the Revenue Department, of rank not lower than that of a Collector, as the Government may, by Notification in the *Fort St. George Gazette*, appoint to hear appeals from such orders. Indian Forest Act, Section 16. Burma Forest Act, Section 16.

Appeal under Section fourteen.

15. Every appeal under Section fourteen shall be made by petition in writing, and may be delivered to the Forest Settlement Officer, who shall forward it without delay to the officer competent to hear the same. Burma Forest Act, Section 17. Indian Forest Act, Section 17.

Hearing of appeals.

Every such appeal shall be heard and disposed of as far as may be in accordance with the provisions of the Code of Civil Procedure, Chapter XLI, and the order passed thereon shall be final.

Notification declaring forest reserved.

16. When the following events have occurred, (viz.)— Burma Forest Act, Section 18. Indian Forest Act, Section 19.

(*a*) the period fixed under Section six for preferring claims has elapsed, and all claims (if any) made within such period have been disposed of by the Forest Settlement Officer; and

(*b*) if such claims have been made, the period fixed by Sections ten and fourteen for appealing from the orders passed on such claims has elapsed, and all appeals (if any) presented within such period have been disposed of by the appellate authority; and

(*c*) all proceedings prescribed by Section ten have been taken, and all lands (if any) to be included in the proposed forest, which the Forest Settlement Officer has, under Section ten, elected to acquire under the Land Acquisition Act, 1870, have become vested in the Government under Section sixteen of that Act;

the Governor in Council may publish a Notification in the *Fort St. George Gazette*, specifying the limits of the forest which it is intended to reserve, and declaring the same to be reserved from a date fixed by such Notification.

The Forest Settlement Officer shall, before the date so fixed, publish such Notification in the manner prescribed for the proclamation under Section six.

From the date so fixed, such forest shall be deemed to be a reserved forest.

Extinction of rights not claimed.

17. Rights in respect of which no claim has been preferred under Section six shall thereupon be extinguished, unless, before the publication of such Notification, the person claiming them has satisfied the Forest Settlement Officer that he had sufficient cause for not preferring such claim within the period fixed under Section six; in which case the Forest Settlement Officer shall proceed to dispose of the claim in the manner hereinbefore provided. Burma Forest Act, Section 19. Indian Forest Act, Section 9.

No right acquired over reserved forest except as here provided.

18. No right of any description shall be acquired in or over a reserved forest, except by succession, or under a grant or contract in writing made by or on behalf of the Government or some person in whom such right, or the power to create such right, was vested when the Notification under Section sixteen was published: Burma Forest Act, Section 22. Indian Forest Act, Section 22.

Provided that no patta shall be granted on behalf of Government for any land included within a reserved forest, and any patta so granted shall be null and void.

Rights not to be alienated without sanction.

19. Notwithstanding anything herein contained, no right continued under Section twelve shall be alienated by way of grant, sale, lease, mortgage or otherwise without the sanction of the Government: provided that, when any such right is continued for the beneficial enjoyment of any land or buildings it may be sold or otherwise alienated with such land or buildings without such sanction. Any alienation of such right in contravention of this section shall be null and void. Burma Forest Act, Section 23. Indian Forest Act, Section 23.

No forest produce obtained in exercise of any right continued under Section twelve shall be sold or bartered except to the extent defined by the order recorded under Sections eleven and twelve.

Any person selling or bartering any forest produce in contravention of this section shall be punished with imprisonment which may extend to one month, or with fine which may extend to two hundred rupees or with both.

Indian Forest Act, Section 24. Burma Forest Act, Section 24.

Power to stop ways and water-courses in reserved forest.

20. The District Forest Officer may, from time to time, with the previous sanction of the Government, stop any public or private way or water-course in a reserved forest: provided that a substitute for the way or water-course so stopped which the Government deems to be reasonably convenient already exists, or has been provided or constructed in lieu thereof.

Indian Forest Act, Section 25. Burma Forest Act, Sections 25, 26, and 27.

Penalties for trespass or damage in reserved forests, and acts prohibited in such forests.

21. Any person who—

(*a*) makes any fresh clearing prohibited by Section seven; or

(*b*) sets fire to a reserved forest, or kindles, or leaves burning any fire in such manner as to endanger the same;

or who, in a reserved forest,

(*c*) kindles, keeps or carries any fire except at such seasons and in such manner as the District Forest Officer may from time to time notify;

(*d*) trespasses, or pastures cattle, or permits cattle to trespass;

(*e*) fells, girdles, marks, lops, taps, uproots or burns any tree, or strips off the bark or leaves from, or otherwise damages the same;

(*f*) quarries stone, burns lime or charcoal, or collects, subjects to any manufacturing process or removes any forest produce;

(*g*) clears, cultivates or breaks up any land for cultivation or any other purpose; or,

(*h*) in contravention of any rules made by the Governor in Council, hunts, shoots, fishes, poisons water or sets traps or snares;

(*i*) damages, alters or removes any wall, ditch, embankment, fence, hedge or railing;

shall be punished with imprisonment for a term which may extend to six months, or with fine which may extend to five hundred rupees, or with both, in addition to such compensation for damage done to the forest as the convicting Court may direct to be paid.

Acts exempted from prohibition contained in this section.

Nothing in this section shall be deemed to prohibit (*a*) any act done in accordance with any rule made by the Government, or with the permission in writing of the District Forest Officer or of an officer authorized by him to grant such permission; or (*b*) the exercise of any right continued under Section twelve or created by grant or contract in the manner described in Section eighteen.

Provided that this section shall not be held to interfere with such working of the forest as may be ordered by the District Forest Officer.

Indian Forest Act, Section 25, last clause. Burma Forest Act, Section 28.

Suspension of rights in reserved forests.

22. Whenever fire is caused wilfully or negligently in a reserved forest, the Government may (notwithstanding that a penalty has been inflicted under Section twenty-one) direct that in such forest or any portion thereof the exercise of all rights of pasture or to forest produce shall be suspended for such period not exceeding twenty years as it thinks fit.

Indian Forest Act, Section 78. Burma Forest Act, Section 76.

Persons bound to assist Forest Officer and Police Officer.

23. Every person who exercises any right in a reserved forest, or who is permitted to take any forest produce from, or to cut and remove timber or to pasture cattle in, such forest; and

every person who is employed by any such person in such forest; and

every village officer or person in any village contiguous to such forest who is employed by the Government;

shall be bound to furnish without unnecessary delay to the nearest Forest Officer or Police Officer any information he may possess respecting the occurrence of a fire in or near such forest, or the commission of, or intention to commit, any forest offence; and shall assist any Forest Officer or Police Officer demanding his aid—

(*a*) in extinguishing any fire occurring in such forest;

(*b*) in preventing any fire which may occur in the vicinity of such forest from spreading to such forest;

(*c*) in preventing the commission in such forest of any forest offence;

and shall, in the absence of any Forest Officer or Police Officer, be bound to take such steps as may be necessary to prevent or extinguish such fire or to prevent the commission of any forest offence in such forest.

Any person infringing the provisions of this section shall be punished with imprisonment for a term which may extend to one month, or with fine which may extend to two hundred rupees, or with both.

Indian Forest Act, Section 26. Burma Forest Act, Section 29.

Power to declare forests no longer reserved.

24. The Government may, with the previous sanction of the Governor-General in Council, by Notification in the *Fort St. George Gazette*, direct that, from a date fixed by such Notification, any forest or any portion thereof reserved under this Act shall cease to be reserved.

From the date so fixed, such forest or portion shall cease to be reserved; but the rights (if any) which have been extinguished therein shall not revive in consequence of such cessation.

Indian Forest Act, Section 34. Burma Forest Act, Section 30.

Forests reserved previous to the passing of this Act.

25. The Government may, by Notification in the *Fort St. George Gazette*, declare any forest which has been reserved by order of the Government previous to the day on which this Act comes into force, to be a reserved forest under this Act:

Provided that if the rights of the Government or of private persons to or over any land or forest produce in such forest have not been enquired into, settled and recorded in a manner which the Government thinks sufficient, the same shall be enquired into, settled and recorded in the manner provided by this Act for reserved forests, before the date on which the Notification declaring the forest to be reserved takes effect.

All questions decided, orders issued, and records prepared in connection with the reservation of such forest shall be deemed to have been decided, issued, and prepared hereunder, and the provisions of this Act relating to reserved forests shall apply to such forest.

CHAPTER III.

Protection of Land at the disposal of Government not included in Reserved Forests.

Power to declare land at the disposal of Government not included in reserved forest, reserved land.

26. The Collector, with the sanction of the Board of Revenue or such other controlling Revenue authority as the Government may from time to time appoint, may, by Notification in the official gazette of the district, declare any land at the disposal of Government not included in a reserved forest, to be reserved land, and may, with the previous sanction of the Government direct that such land shall cease to be reserved land. New.

Grant of patta in such land prohibited.

27. No patta shall be granted on behalf of Government in any land reserved under Section twenty-six, and any patta so granted shall be null and void. New.

Leases may be granted.

28. Nothing in this Act shall be held to prevent the grant of leases by the Collector of the district in any reserved land, for a definite period not exceeding twelve months. New.

In any lease granted under this section provision may be made for the reservation of all or any classes of trees standing upon lands so leased, and the provisions of Section thirty-three shall apply to such trees or classes of trees.

Any such lease may be cancelled at the discretion of the Collector, if, in his opinion, the lessee has failed to fulfil any of the conditions thereof.

Power to make rules.

29. The Governor in Council may, for any district, or portion of a district, make rules to regulate the use of the pasturage or of the natural produce of land at the disposal of Government. Such rules may, with respect to such land— Burma Act, Section 37.

(*a*) regulate or prohibit the clearing or breaking up of land for cultivation or other purposes;

(*b*) regulate or prohibit the kindling of fires, and prescribe the precautions to be taken to prevent the spreading of fires;

(*c*) regulate or prohibit the cutting, sawing, conversion and removal of trees and timber, and the collection and removal of natural produce;

(*d*) regulate or prohibit the quarrying of stone, the boiling of catechu, or the burning of lime or charcoal;

(*e*) regulate or prohibit the cutting of grass and pasturing of cattle, and regulate the payments (if any) to be made for such cutting or pasturing;

(*f*) regulate or prohibit hunting, shooting, fishing, poisoning water and setting traps or snares;

(*g*) regulate the sale or free grant of timber or other natural produce; and,

(*h*) prescribe the fees, royalties or other payments for such timber or other natural produce, and the manner in which such fees, royalties or other payments shall be levied.

Penalties for acts in contravention of rules.

The Governor in Council may by such rules prescribe, as penalties for the infringement thereof, imprisonment for a term which may extend to one month or fine which may extend to two hundred rupees, or both.

Area to which rules shall apply.

30. Rules made under the preceding section shall apply to all reserved land in the district, or portion of a district for which they may have been made, and the Collector, with the sanction of Government, may, by Notification in the official gazette of the district, from time to time declare that all or any of them shall apply to any other land at the disposal of Government, and thereupon such rules shall apply accordingly. New.

Power to close land against pasture.

31. Whenever fire is caused wilfully or negligently in any land to which the rules made under Section twenty-nine have been extended, the Government may, notwithstanding that a penalty has been inflicted under that section, direct that such land be closed against pasture for such period not exceeding twenty years as it thinks fit: New.

Provided that an area sufficient in extent and in a locality reasonably convenient is left open for the use of persons having rights of pasture in such land.

Burma Forest Act, Section 35.

Reserved trees.

32. All teak, sandal, and red sander trees standing on any land at the disposal of Government not included in a reserved forest shall be reserved trees.

The Governor in Council may by notification in the *Fort St. George Gazette*—

(*a*) declare that any other trees or any specified class of other trees standing on any land at the disposal of Government shall, from a date to be fixed by such Notification, be reserved trees within a certain district or on certain classes of land;

(*b*) vary or cancel any such Notification.

Burma Forest Act, Section 36.

Protection of reserved trees.

No person shall fell, girdle, mark, lop, tap, uproot, burn or strip off the bark or leaves from any reserved tree, except as provided by rules made by the Government in this behalf.

New.

Penalties.

33. Whoever cultivates in any reserved land or clears any reserved land, or pastures cattle or permits cattle to trespass in land closed under Section thirty-one, or infringes the provisions of Section thirty-two, shall be punished with imprisonment for a term which may extend to one month, or with fine which may extend to two hundred rupees, or with both.

Burma Forest Act, Section 38.

Rights and authorized acts saved.

34. Nothing in this chapter, or in any rule made under it, shall be deemed to abridge or affect any existing rights of individuals or communities, and nothing in Sections twenty-nine to thirty-three, both inclusive, or in any rule under Sections twenty-nine and thirty-two, shall be deemed to prohibit any act done under the authority of the Collector.

CHAPTER IV.

Protection of Land not at the disposal of Government or in which Government has a limited interest.

New.

On certain lands the firing of grass, trees, and timber may be regulated or prohibited.

35. Whenever the Governor in Council considers that the firing of grass, trees, and timber in any land should be regulated or prohibited, in order to secure the maintenance of a water-supply in springs, rivers, and tanks, or to prevent the spread of fire to a reserved forest, or to land at the disposal of Government, he may by Notification in the *Fort St. George Gazette* declare such land subject to the provisions of Sections thirty-five to forty of this Act, both inclusive; and may alter or cancel such Notification:

Provided that no such Notification shall be made until after the issue of a Proclamation published at the head-quarters of each taluk in which any portion of the land to be included in such Notification is situated, and in the towns and villages in the neighbourhood of such land. Such Proclamation shall specify—

(*a*) the situation and limits of the area which it is proposed to include in the Notification; and

(*b*) The consequences which, as hereinafter provided, will ensue on the issue of such Notification:

and shall call on all persons interested in such land to show cause within a period of not less than three months why such Notification should not be made, or why any land should be excluded from its operation.

All objections made to the issue of such Notification, and any evidence which may be produced in support of such objections, shall be heard and disposed of by the Collector subject to the orders of the Government, whose decision in such case shall be final.

New.

Collector may issue orders.

36. In respect of any land included in a Notification made under Section thirty-five, the Collector may issue orders regulating or prohibiting the firing of grass, trees, and timber in any such land, so far as may be necessary for the maintenance of a water-supply in springs, rivers and tanks, or to prevent the spread of fire to a reserved forest or to land at the disposal of Government; and may, from time to time, cancel or vary such orders.

New.

Power to assume control of land.

37. If such orders be neglected or wilfully disobeyed, the Collector may issue a Notice to the owner of such land requiring observance of the same, and informing him that if such neglect or disobedience is repeated or continued, the land will be taken under management as hereinafter provided. If such neglect or disobedience is thereafter repeated or continued, the Collector may, after further notice in writing to the said owner and after considering his objections (if any), assume control of the land and may make such arrangements for its management as may be necessary.

Government may in such case declare that all or any of the provisions of this Act shall apply to such land, and thereupon such provisions shall apply accordingly.

Government may remove land from control of Collector.

38. When the Collector has, under the preceding section, assumed control of any land, such control shall continue for a period of not less than ten years. At any time after the expiration of such period, the Government may, on the application of the owner, or otherwise, direct that such control shall cease. New.

Accounts to be rendered to owner.

39. At the end of each official year during which the land remains under the control of the Collector, he shall render an account of receipts and charges to the owner. In the event of the owner objecting to any items in such account, the decision of the Government in regard to such objection shall be final. New.

Profits to be paid to owner.

40. Immediately on the rendering of the account the Collector shall pay to the owner such surplus of receipts over charges as may be shown therein, and shall further pay any sum which may be allowed by the Government under the preceding section. If in any year the charges exceed the receipts, the excess shall not be chargeable against such owner. New.

Protection of forests at request of owners.

41. The owner of any land or, if there be more than one owner thereof, the owners of shares therein, whether divided or not, amounting in the aggregate to at least two-thirds thereof may, with a view to the formation or conservation of forests thereon, represent in writing to the Collector their desire— Indian Forest Act, Section 38.

(*a*) that such land be managed on their behalf by the District Forest Officer, as a reserved forest, on such terms as may be mutually agreed upon; or

(*b*) that such land be managed, subject to the control of the Collector, by a person appointed by themselves and approved by the Collector; or,

(*c*) that all, or any of the provisions of this Act or rules made thereunder be applied to such land.

The Government may in any such case, by Notification in the *Fort St. George Gazette*, apply to such land such provisions of this Act as it thinks suitable to the circumstances thereof and as may be desired by the applicants.

Any such Notification may be altered or cancelled by a like Notification.

Management of forests, the joint property of Government and other persons.

42. If the Government and any person or persons be jointly interested in any forest or waste-land, or in the whole or any part of the produce thereof, the Government may either— Indian Forest Act, Section 79.

(*a*) undertake the management of such forest, waste-land or produce, accounting to such person for his interest in the same; or

(*b*) issue such regulations for the management of the forest, waste-land or produce by the person so jointly interested, as it deems necessary for the management thereof and the interests of all parties therein.

When the Government undertakes, under clause (*a*) of this section, the management of any forest, waste-land or produce, it may, by Notification in the *Fort St. George Gazette*, declare that any of the provisions contained in Chapters II and III of this Act shall apply to such forest, waste-land or produce, and thereupon such provisions shall apply accordingly.

Persons employed to carry out the Act to be deemed "Forest Officers."

43. All persons employed under Sections thirty-seven, forty-one, and forty-two to carry out the provisions of this Act shall be deemed to be "Forest Officers" within the meaning of this Act. New.

No suit to lie against Government.

44. No suit shall lie against Government or its officers for any thing done in good faith under the provisions of this chapter. New.

CHAPTER V.

Control of Timber in Transit.

Power to make rules to regulate transit of timber.

45. The Governor in Council may make rules to regulate the transit of all timber or of certain classes of timber within local limits as may appear to be necessary. Such rules may (among other matters)— Burma Forest Act, Section 43. Indian Forest Act, Section 41.

(*a*) prescribe the routes by which alone timber may be imported into and exported from the Presidency of Madras;

(*b*) prohibit the import and export or moving within defined local limits of timber without a pass from the landholder from whose lands it was brought, or from an officer duly authorised to issue the same, or otherwise than in accordance with the conditions of such pass;

(*c*) prescribe the form of such passes and provide for their issue, production and return;

(*d*) provide for the stoppage, reporting, examination and marking of timber in transit within defined local limits or at stations established as hereinafter provided;

(*e*) establish, or authorise the Collector to establish stations to which such timber shall be taken by those in charge of it for examination, or marking; and the conditions under which such timber shall be brought to, stored at, and removed from, such station;

(*f*) provide for the management and control of such stations, and for regulating the appointment and duties of persons employed thereat;

(*g*) authorise the transport of timber, the property of Government, across any land, and provide for the payment of compensation for any damage done by the transport of such timber;

(*h*) prohibit the closing up or obstructing of the channel or banks of any river used for the transit of timber or other forest produce, and the throwing of grass, brushwood, branches and leaves into any such river, or any act which may cause such river to be closed or obstructed;

(*i*) provide for the prevention and removal of any obstruction of the channel or banks of any such river, and for recovering the cost of such prevention or removal from the person, or by the sale of any timber causing such obstruction;

(*j*) provide for the protection of bridges, locks or other public works, by regulating the floating of timber, and by authorising the seizure of timber floated in contravention of such rules or by which any damage to such works may have been caused, and the detention and disposal of such timber until compensation has been made for the damage done;

(*k*) regulate the use of property-marks for timber and the registration of such marks; declare the circumstances in which the registration of any property-marks may be refused or cancelled; prescribe the time for which such registration shall hold good; limit the number of such marks that may be registered by any one person; and provide for the levy of fees for such registration.

Burma Forest Act, Section 44. Indian Forest Act, Section 42.

Penalties for breach of rules made under Section 45.

46. The Government may, by such rules, prescribe as penalties for the infringement thereof, imprisonment for a term which may extend to one month, or fine which may extend to two hundred rupees, or both.

In cases where the offence is committed after sunset and before sunrise, or after making preparation for resistance to the execution of any law or any legal process, or where the offender has been previously convicted of a like offence, the convicting Magistrate may inflict double the penalty prescribed for such offence.

CHAPTER VI.

Penalties and Procedure.

Burma Forest Act, Section 52. Indian Forest Act, Section 52. Government Forests Act, No. VII of 1865, Section 8.

Seizure of property liable to confiscation.

47. When there is reason to believe that a forest offence has been committed in respect of any timber or forest produce, such timber or produce, together with all tools, ropes, chains, boats, carts, and cattle used in committing any such offence, may be seized by any Forest Officer or Police Officer.

Report to Magistrate.

Every officer seizing any property under this section shall place on such property, or the receptacle (if any) in which it is contained, a mark indicating that the same has been so seized, and shall, as soon as may be, make a report of such seizure to the Magistrate having jurisdiction to try the offence on account of which the seizure has been made:

Provided that when the timber or forest produce with respect to which such offence is believed to have been committed is the property of Government and the offender is unknown, it shall be sufficient if the officer makes, as soon as may be, a report of the circumstances to his official superior.

Burma Forest Act, Section 53. Indian Forest Act, Section 53.

Procedure thereupon.

48. Upon the receipt of any such report, the Magistrate shall take such measures as may be necessary for the trial of the accused and the disposal of the property according to law.

Burma Forest Act, Section 54. Indian Forest Act, Section 54.

Timber, forest produce, tools, &c., when liable to confiscation.

49. When any person is convicted of a forest offence, all timber or forest produce in respect of which such offence has been committed, and all tools, ropes, chains, boats, carts, and cattle used in committing such offence, shall be liable, by order of the convicting Magistrate, to confiscation.

Such confiscation may be in addition to any other punishment prescribed for such offence.

Burma Forest Act, Section 55. Indian Forest Act, Section 55.

Disposal on conclusion of trial for forest offence, of produce in respect of which it was committed.

50. When the trial of any forest offence is concluded, any timber or forest produce in respect of which such offence has been committed shall, if it is the property of Government or has been confiscated, be taken possession of by or under the authority of the District Forest Officer; and in any other case may be disposed of in such manner as the Court may order.

Procedure when offender is not known or cannot be found.

51. When the offender is not known or cannot be found, the Magistrate, if he is of opinion that an offence has been committed, may on application in this behalf order the property in respect of which the offence has been committed to be confiscated and taken possession of by or under the authority of the District Forest Officer, or to be made over to any person whom the Magistrate considers to be entitled to the same : Burma Forest Act, Section 56. Indian Forest Act, Section 56.

Provided that no such order shall be made until the expiration of one month from the date of seizing such property, or without hearing the person (if any) claiming any right thereto, and the evidence (if any) which he may produce in support of his claim.

The Magistrate shall cause a notice of any application under this section to be served upon any person whom he has reason to believe is interested in the property seized, or shall publish such notice in any way which he thinks fit.

Procedure as to perishable property seized under Section forty-seven.

52. The Magistrate may, notwithstanding anything hereinbefore contained, direct the sale of any property seized under Section forty-seven and subject to speedy and natural decay, and may deal with the proceeds as he might have dealt with such property if it had not been sold. Indian Forest Act, Section 57. Burma Forest Act, Section 57.

Appeal from orders under Sections forty-nine, fifty or fifty-one.

53. Any person claiming to be interested in property seized under Section forty-seven may, within one month from the date of any order passed under Sections forty-nine, fifty or fifty-one, present an appeal therefrom to the Court to which orders made by such Magistrate are ordinarily appealable, and the order passed on such appeal shall be final. Burma Forest Act, Section 58. Indian Forest Act. Section 58.

Property when to vest in Government.

54. When an order for the confiscation of any property has been passed under Sections forty-nine or fifty-one, and the period limited by Section fifty-three for presenting an appeal from such order has elapsed, and no such appeal has been presented, or when on such an appeal being presented the Appellate Court confirms such order in respect of the whole or a portion of such property, such property or portion, as the case may be, shall vest in the Government free from all incumbrances. Burma Forest Act, Section 59. Indian Forest Act, Section 59.

Saving of power to release property seized.

55. Nothing hereinbefore contained shall be deemed to prevent the District Forest Officer from directing at any time the immediate release of any property seized under Section forty-seven and the withdrawal of any charge made in respect of such property. Burma Forest Act, Section 60. Indian Forest Act, Section 60.

Penalty for counterfeiting or defacing marks on trees and timber, and for altering boundary marks.

56. Whoever with intent to cause damage or injury to the public or to any person, or to cause wrongful gain as defined in the Indian Penal Code— Burma Forest Act, Section 62. Indian Forest Act, Section 62.

(*a*) knowingly counterfeits upon any timber or standing tree a mark used by Forest Officers to indicate that such timber or tree is the property of the Government or of some person, or that it may lawfully be cut or removed by some person ; or

(*b*) unlawfully affixes to any timber or standing tree a mark used by Forest Officers ; or

(*c*) alters, defaces or obliterates any such mark placed on any timber or standing tree by or under the authority of a Forest Officer ; or

(*d*) alters, moves, destroys or defaces any boundary-mark of any forest or any land to which any provisions of this Act apply ;

shall be punished with imprisonment for a term which may extend to two years or with fine which may extend to one thousand rupees, or with both.

Power to arrest without warrant.

57. Any Forest Officer or Police Officer may, without orders from a Magistrate and without a warrant, arrest any person who in his view commits a forest offence, or who, within the limits of a reserved forest or of land to which the rules made under Section twenty-nine have been applied, is found under circumstances which create reasonable presumption that he has been concerned in a forest offence. Indian Forest Act, Section 63. Burma Forest Act, Section 63. Government Forests Act, No. VII of 1865, Section 8.

Every officer making an arrest under this section shall without unnecessary delay take or send the person arrested to the nearest police station, and the officer in charge of such station shall thereupon act according to law.

Punishment for wrongful seizure or arrest.

58. Any Forest Officer or Police Officer who vexatiously and unnecessarily seizes any property on pretence of seizing property liable to confiscation under this Act, or who vexatiously and unnecessarily arrests any person, shall be punished with imprisonment for a term which may extend to six months, or with fine which may extend to five hundred rupees, or with both. Indian Forest Act, Section 61. Burma Forest Act, Section 61. Government Forests Act, No. VII of 1865, Section 12.

Power to prevent commission of offence

59. Every Forest Officer and Police Officer shall prevent, and may interfere for the purpose of preventing, the commission of any forest offence. Indian Forest Act, Section 64. Burma Forest Act, Section 64.

Operation of other laws not barred.

60. Nothing in this Act shall be deemed to prevent any person from being prosecuted under any other law for any act or omission which constitutes a forest offence, or from being liable under such other law to any higher punishment or penalty than that provided by this Act or the rules made hereunder : Burma Forest Act, Section 65. Indian Forest Act, Section 66.

Provided that no person shall be punished twice for the same offence.

Burma Forest Act, Section 66. Indian Forest Act, Section 67.

Power to compound offences.

61. Any Forest Officer specially empowered in this behalf may accept from any person, reasonably suspected of having committed any forest offence other than an offence under Section fifty-six or Section fifty-eight, a sum of money by way of compensation for the offence which may have been committed; and where any property has been seized as liable to confiscation, may release the same on payment of the value thereof as estimated by such officer.

On the payment of such sum of money, or such value, or both, as the case may be, to such officer, the accused person, if in custody, shall be discharged, the property seized shall be released, and no further proceedings shall be taken against such person or property.

Indian Forest Act, Section 68. Burma Forest Act, Section 67.

Presumption that timber or forest produce belongs to Government.

62. When in any proceedings taken under this Act, or in consequence of anything done under this Act, a question arises as to whether any forest produce is the property of the Government, such produce shall be presumed to be the property of the Government until the contrary is proved.

CHAPTER VII.

Cattle-trespass.

Indian Forest Act, Section 69. Burma Forest Act, Section 68.

Cattle-trespass Act, 1871, to apply.

63. Cattle trespassing in a reserved forest or on lands on which the grazing of cattle has been prohibited by rules made under Section twenty-nine, or which has been closed under Section thirty-one, shall be deemed to be cattle doing damage to a public plantation within the meaning of the eleventh section of the Cattle-trespass Act, 1871, and may be seized and impounded as such by any Forest Officer or Police Officer.

Indian Forest Act, Section 70. Burma Forest Act, Section 69.

Power to alter fines fixed by that Act.

64. The Governor in Council may, by Notification in the *Fort St. George Gazette*, direct that, in lieu of the fines fixed by the twelfth section of the Act last aforesaid, there shall be levied for each head of cattle impounded under Section sixty-three of this Act, such fines as he thinks fit, but not exceeding the following (that is to say):

	RS.	A.	P.
For each elephant	10	0	0
For each buffalo or camel	2	0	0
For each horse, mare, gelding, pony, colt, filly, mule, bull, bullock, cow, calf, or heifer	1	0	0
For each ass, pig, ram, ewe, sheep, lamb, goat or kid ...	0	8	0

CHAPTER VIII.

Forest Officers.

Burma Forest Act, Section 70. Indian Forest Act, Section 71.

Governor in Council may invest Forest Officers with certain powers.

65. The Governor in Council may invest any Forest Officer by name, or as holding an office with the following powers (that is to say):—

(*a*) the powers of a Settlement Officer under the Madras Boundaries Act No. XXVIII of 1860;

(*b*) the powers of a Civil Court to compel the attendance of witnesses and the production of documents;

(*c*) power to issue search-warrants under the Code of Criminal Procedure;

(*d*) power to hold enquiries into forest offences, and in the course of such enquiries to receive and record evidence;

(*e*) power to accept compensation for forest offences under Section sixty-one;

and may withdraw any powers so conferred.

Any evidence recorded under clause (*d*) of this section shall be admissible in any subsequent trial before a Magistrate of the alleged offender: Provided that it has been taken in the presence of the accused person, and recorded in the manner provided by Section 333, Section 334 or Section 335 of the Code of Criminal Procedure.

Indian Forest Act, Section 72. Burma Forest Act, Section 71.

Forest Officers deemed public servants.

66. All Forest Officers shall be deemed to be public servants within the meaning of the Indian Penal Code.

Burma Forest Act, Section 72. Indian Forest Act, Section 73.

Indemnity for acts done in good faith:

67. No suit or criminal prosecution shall lie against any public servant for anything done or omitted by him in good faith under this Act.

Burma Forest Act, Section 73. Indian Forest Act, Section 74.

Forest Officers not to trade.

68. Except with the permission in writing of the Governor in Council, no Forest Officer shall, as principal or agent, trade in timber or forest produce, or be or become interested in any lease or mortgage of any forest, or in any contract for working any forest, whether in British or foreign territory.

CHAPTER IX.

Miscellaneous.

Additional powers to make rules.

69. The Governor in Council may make rules consistent with this Act— Indian Forest Act, Section 75. Burma Forest Act, Section 74.

(*a*) to declare by what Forest Officer or class of Forest Officers the powers or duties conferred or imposed by or under this Act on a Forest Officer shall be exercised or performed;

(*b*) to regulate the procedure of Forest Settlement Officers;

(*c*) to regulate the rewards to be paid to officers and informers from the proceeds of fines and confiscations under this Act, or from the public treasury;

(*d*) for the preservation, reproduction, and disposal of trees and timber belonging to Government, but grown on lands belonging to or in the occupation of private persons; and

(*e*) generally to carry out the provisions of this Act.

Rules when to have force of law.

70. All rules made by the Governor in Council under this Act shall be published in the *Fort St. George Gazette*, and shall thereupon have the force of law. Such rules may be cancelled or varied by like Notification. Burma Forest Act, Section 75. Indian Forest Act, Section 77.

Powers of Government exercisable from time to time.

All powers conferred by this Act on the Government may be exercised from time to time as occasion requires.

Governor in Council may delegate powers.

71. It shall be lawful for the Governor in Council to delegate any of the powers conferred by Sections nineteen, twenty, twenty-two, thirty-one, sixty-four and sixty-eight, to the Board of Revenue, or to such other controlling Revenue authority as the Government may from time to time appoint. New.

Recovery of money due to Government.

72. All money, other than fines, payable to the Government under this Act, or any rule made hereunder, or on account of timber or forest produce, or of expenses incurred in the execution of this Act in respect of timber or forest produce, and all compensation awarded to Government under this Act may, if not paid when due, be recovered, under the law for the time being in force, as if it were an arrear of land revenue. Burma Forest Act, Section 77. Indian Forest Act, Section 81.

Lien on forest produce for such money.

73. When any such money is payable for, or in respect of, any forest produce, the amount thereof shall be deemed to be a first charge on such produce; and if such amount be not paid when due such produce may be taken possession of by or under the authority of the District Forest Officer, and may be retained until such amount has been paid, or such Forest Officer may sell such produce by public auction, and the proceeds of the sale shall be applied first in discharging such amount. Burma Forest Act, Section 78. Indian Forest Act, Section 82.

Power to sell such produce.

The surplus (if any), if not claimed within two months from the date of the sale by the person entitled thereto, shall be forfeited to Government.

Land required under this Act to be deemed to be needed for a public purpose under the Land Acquisition Act.

74. Whenever it appears to the Governor in Council that any land is required for any of the purposes of this Act, such land shall be deemed to be needed for a public purpose within the meaning of the Land Acquisition Act, 1870, Section four. Indian Forest Act, Section 83. Burma Forest Act, Section 80.

APPENDIX III.

JOINT REPORT ON ORGANIZATION OF FOREST BUSINESS, DATED 9TH JUNE 1882.

IN the Order of Government, No. 511, dated the 15th May 1882, the undersigned were desired to consider the rules by which the relations of Civil and Forest Officers should, in future, be regulated, and we now submit our views on the subject. In our remarks we shall have to discuss certain important changes which should, in our opinion, be introduced in the administration of forests in this Presidency, in order to place this branch of the public business upon a satisfactory footing.

Jungle Conservancy and Forests.

2. The most necessary reform is the abolition of the double organization now existing, whereby a portion of the forest lands are managed by the Forest Department and a portion by the Revenue Department under the denomination of Jungle Conservancy. Most of the forests in the hills and a few in the plains and open country are in the charge of Forest Officers, and are

subject to one set of rules, while some of the hill forests and the greater portion of the jungles in the plains are under officers of the Jungle Conservancy Fund, and are subject to another set of rules.

3. Thus all forests and jungles in the Nellore and Chingleput Districts, including the forests of Sriharikóta and those on the Kambakam and Nagalapuram hills are under Jungle Conservancy Rules, as are also the jungles of Bellary and Anantapur, whether situated on the hills or in the plains. In other districts, such as Cuddapah, South Arcot, and Madura, the jungles in certain taluks are under Forest Rules, and those in others are under Jungle Conservancy Rules. In North Arcot, South Arcot, and Trichinopoly the District Forest Officer has charge of both classes of land, which are often contiguous to each other, but are nevertheless managed under separate rules and by separate establishments, although, in some cases, it has been found convenient to place contiguous Forest reserves and Jungle Conservancy lands under one Forest Ranger or Forester.

4. There is nothing in the character of the two classes of lands to call for different rules and separate establishments, nor is there any difference, except in name and on paper, between the two. If the woodlands now under Jungle Conservancy Rules are to be preserved and improved, so as to be a benefit to the country, they must be managed, as they are in South Arcot, by professional Forest Officers, and their protection will require the same legal provisions as the protection of the forests. The same principles of forest management apply in both cases, and we are of opinion that in all districts the separation should be done away with, and the administration of the Jungle Conservancy lands transferred to the District Forest Officers.

5. The separation appears to have been in its origin accidental, and to have arisen from the restricted scale on which the Forest Department was first constituted. Its officers were few and confined to a few districts; but the necessity of some measures of conservancy in other places also being felt, the Jungle Conservancy, under the only agency possible, namely, the ordinary district staff, originated. Now, however, that an adequate and efficient forest staff is, it is hoped, about to be organized and maintained, the separation is no longer defensible, and should be put an end to.

6. Apart from general considerations in favor of the abolition of Jungle Conservancy as a separate institution, we think there is ground for the contention that its operations have not been very successful, and that they have done but little to secure the objects in view.

7. In their Order of the 23rd January 1879, No. 186, the Government stated that the primary objects of the Jungle Conservancy "are (1) the saving of minor woods in the neighbourhood of villages from the destruction naturally following from unrestricted and ill-advised use; and (2) by proper control effected from the funds raised from the villagers to secure to the villagers the permanent advantages of an adequate supply of fuel and of wood for building and agricultural purposes in near proximity to their villages."

8. In the South Arcot District a number of tracts of waste and scrub land have been set apart, some of which have been efficiently protected and their condition much improved. Similar work has been done in Chingleput and Nellore; but upon the whole very little has been accomplished to give effect to the intentions of Government in this respect. A portion of the revenue is derived from seigniorage and other payments on account of the produce of natural jungles; but of this revenue a fraction only has been expended upon such jungles in return. The denudation of waste lands and the deterioration of growth upon them goes on as before almost unchecked.

9. Excellent plantations of casuarina and other trees have been formed in the Nellore and South Arcot Districts from Jungle Conservancy funds; but, on the other hand, much money has been spent on the planting of topes, mostly of fruit trees, designed for the convenience of villagers and travellers. Topes of trees are exceedingly useful, particularly in the more arid districts; but this is not what was originally intended, and it appears to be the almost unanimous opinion of the District Officers that much of the money spent on these topes has been wasted, and that the expenditure has been out of proportion to the results achieved. The selection of sites, as regards soil and other conditions, has often been unfortunate, and in many cases the trees have not grown and the topes have been abandoned. In some districts Collectors have recommended that the topes which remain should be sold, although it is acknowledged that they will not fetch more than a fraction of what they have cost. In some districts a large proportion of the topes has already been sold. If the money which has been expended in these efforts had been laid out with system and knowledge towards the formation and improvement of reserves of natural growth, the result, it cannot be doubted, would have been out of all proportion of greater benefit to the country.

10. It has been maintained that the Jungle Conservancy lands are managed for the benefit of the villages, while the forests are managed for the benefit of the Imperial Revenue; and that since the revenue of the Jungle Conservancy is raised from the villagers locally and on account of the use of their village jungles, it ought to be credited to a separate fund and expended on such jungles alone. Under the existing practice the legitimate requirements of the ryots are provided for without payment under the free pass rules and other concessions, and whatever revenue is yielded by village jungles is derived from seigniorage paid by outsiders, or by persons whose requirements are in excess of the legitimate scale. There is no such thing as a limitation

of the use of the jungles to particular communities, or recognition of their rights to the exclusion of others. A man who pays seigniorage may cut in the lands of any village, as may be convenient or allowed, and the revenue derived from such payments is clearly at the disposal of the State. The local argument, if valid at all, would require that the localization of the revenue should be carried much further than at present, and that the revenue raised from each jungle should be spent on it and not elsewhere, which is obviously impracticable. The local principle is as much infringed when, as now, the money goes to a district fund, as it would be if the receipts were merged in the general forest revenue.

11. Besides the seigniorage payments, the Jungle Conservancy Fund is credited with tree-tax and rents of fruit trees and palmyras growing on Government waste lands, on the ground that they must have been planted by the villagers. When such trees grow in forests or lands managed by the officers of the Forest or Jungle Conservancy Department, the revenue derived from them should be credited to Forests, but, when they grow on other lands, it appears to us a question whether these amounts should not rather be credited to Land Revenue. At any rate, we see no special reason for making this revenue local.

12. There seems ground for believing that the seigniorage dues are largely evaded, and, to whatever head the revenue from the minor jungles is credited, it is advisable to place them under improved administration and conservancy. We believe that properly administered they will pay their cost, and yet be improved and increased in value; and that the best mode of dealing with them is to place them under the officers of the professional department, which, we trust, will ere long be reorganized and placed on a satisfactory footing.

13. It has already been stated that in several districts the Jungle Conservancy lands are in charge of the District Forest Officer, and in one of these districts at least, namely, in South Arcot, this arrangement has had a most beneficial effect.

14. All that is wanted is to extend this system to other districts, but with two important modifications. Under existing arrangements the District Forest Officer, when in charge of Jungle Conservancy operations, submits two sets of accounts and reports, one regarding the Forests to the Conservator, and the other regarding the Jungle Conservancy lands through the Collector to the Board of Revenue. The forms of these two sets of accounts and reports, and even the classification of receipts and charges, are entirely different, and this requires double office establishments, and needlessly takes up the time and attention of the Forest Officer. The result is waste of time and money. Again, the Conservator has control in professional matters over the Imperial Forests only, and when on his tours of inspection he passes by, and has no business in the Jungle Conservancy lands, though they are often contiguous to the Forest lands with the same vegetation and general character. There is no difference, except in name, between these two classes of lands, and they should be managed on one system, by one set of officers, and should both have the advantage of professional supervision by the Conservator.

Connection of Civil and Forest administration.

15. These remarks bring us to the consideration of certain further important changes in the organization of the forest administration, which we desire to recommend. The area now placed under the charge of the Conservator is so vast, that it is quite impossible for him to maintain the supervision and control of District Forest Officers, which are necessary to keep them up their work and to secure energetic administration. The intervals between his tours in any district must, however active he may be, be considerable, and he cannot in existing circumstances obtain the immediate and full knowledge of the forest concerns of each district, which the directing officer, in such a matter as forest administration, ought to possess. The result has been hitherto that the District Forest Officers have been left too much to themselves, and, not feeling at hand the direction and support of a superior officer, have to some extent fallen into a position of isolation which has weakened the working of the department. Isolation of this kind is especially prejudicial to young officers during the early years of their service, in whose case the absence of official discipline at first may create habits which may mar their usefulness throughout their subsequent career. The forest establishments are not at present in a satisfactory state in all districts—a fact which has no doubt intensified the evils which we have indicated; but even if the staff were reorganized, these evils would, we think, probably still be felt. Further, it seems to us expedient to strengthen the hands of the local Forest Officers, and to increase their influence, by bringing them into closer connection with the Land Revenue organization. We, therefore, recommend that, subject to the checks hereafter noticed, the District Forest Officers and the staff under them be made directly subordinate to the Collectors.

Former Schemes.

16. The necessity of closely connecting the administration of the forests with that of other Government lands has long been recognized in this Presidency, and attempts have been made at different times to frame an organization under which this object would be attained. By the Order of the 24th June 1872, No. 148, Collectors were made Conservators in their districts, the

Conservator was appointed Inspector, and his duties were restricted to inspection and advice. This was found to work badly, and hence, in 1875, a change was made, and by the order of Government of the 19th November 1875, No. 1662-A, the Inspector was again made Conservator, and certain rules, modelled on those framed in 1870 for the conduct of forest business in Bombay, were sanctioned. Under these rules the control of the forest work is vested in the Conservator, but his orders are communicated to the District Forest Officer through the Collector, to whom certain limited powers of interference are granted.

17. These rules have never perhaps been fully worked, and they have certainly not produced the effects desired. The separation between the Revenue and Forest organizations is still too wide. In the Bombay rules an attempt was made to divide subjects, so that the District Forest Officer would receive his orders from the Conservator on subjects of a professional and departmental character, while in regard to other matters he would be subordinate to the Collector. This division of subjects and control is however artificial, and, if adopted, would in our opinion lead to friction and needless complications. In Madras, where the lands which should be placed under forest administration are, in most cases, distributed over the whole of the districts, and are not confined to remote corners, there is especial reason for uniting as closely as possible the Land Revenue and Forest Administration. The Collector being on the spot and possessing, or being able at once to obtain full local knowledge, is the fittest man to control the current work connected with forest business in his district; and the Forest Officers will gain much by association with the widely extended organization of which he is the local head, and will cease to be regarded as outsiders and oppressors of the people.

Collectors and Conservator.

18. The problem is to gain for local forest working the strength and vitality which it will derive from being placed under the control of Collectors, and at the same time to take security for continuity of action, for the adoption of correct principles of forestry, for due subordination of local to general working, for the creation and maintenance of a properly instructed and efficient staff, and for ensuring to the Conservator the position which he ought to occupy as the professional head of the department and the responsible adviser of Government in forest matters. We believe that under our scheme these objects will be attained.

19. First as to the relations between the Collectors and the Conservator. There are two matters which from the nature of the case, as requiring a comprehensive view of all districts, cannot be dealt with by Collectors. These are the finance of the department and the organization of the staff; and in these the Conservator must have complete authority. Further, in purely professional matters, as to which Collectors cannot be expected to possess adequate knowledge, the Conservator must be in a position to press his views. As to finance, there will, of course, be an annual budget, which will pass through the Board of Revenue and be sanctioned by Government as at present. This will be made up of district budgets; and in close connection with, and, in fact, depending on these budgets will be the annual plans of operations in each district, which will be framed by the District Forest Officer, and discussed, and probably agreed upon by the Collector and Conservator. If they differ as to the budgets and plans of operations, each will have his say, and it will be for the Board of Revenue and Government to decide. This done, the responsibility for the execution will rest with the Collector alone. The existing powers of financial control vested in the Conservator, namely, of making transfers from district to district under "*A—Working Charges*" and "*B—Establishments,*" and of sanctioning estimates for works, should remain with him; but he should not have power to transfer any allotment from a district without the Collector's assent, or order of Government. If during the year the Collector desires to incur expenditure not provided in the budget, he will have to address the Conservator, who, if he approves and can find the money, will make it available. The Conservator will be kept informed of what is going on in all districts, and will be able to watch progress; but the responsibility for the due execution of the programme, and for the conduct of all district business, will rest with the Collector and not with the Conservator. The Collector, however, should not be at liberty to make transfers under "*Working Charges*" in his district without the Conservator's sanction.

20. As to the staff, the scale of establishments will be sanctioned by the Government, and the appointment, posting and promotion of the superior officers rests with them. The appointment, posting and promotion of Forest Rangers and Foresters should vest in the Conservator, and the appointment, posting and promotion of Forest Guards in the Collector, who will no doubt, in practice, leave these matters to his District Forest Officer. The Collector should have the power to fine and suspend forest subordinates, and to dismiss Forest Guards. The dismissal of Rangers and Foresters will rest with the Conservator who appoints them, but he will naturally be guided in his action by the Collectors, who are responsible for the local working and protection of the forests. It is of supreme importance that all Forest Officers, those of the subordinate as well as of the superior staff, shall possess the requisite qualifications and training, and these would not in all cases be secured, nor could the flow of promotion necessary to efficiency in the department, be maintained under a system of local selection by Collectors. In regard to Forest Rangers and Foresters therefore Collectors must accept the

Conservator's decisions, though no doubt that officer will, as far as he can, consult the convenience and wishes of the Collectors in the disposal of the staff.

21. Professional matters will eventually be mainly regulated by working plans prepared for each forest. But such working plans can, as a rule, only be prepared for reserved forests which have been completely demarcated and settled. Whenever circumstances are sufficiently advanced to justify the preparation of such working plans for any forest, the data will generally be collected and the proposals framed by a specially qualified Forest Officer, working in conjunction with the District Forest Officer and under the control of the Conservator. When completed, such working plans should be concurred in by the Collector, and if intended to regulate operations during a long series of years, they should be submitted to higher authority for sanction. No deviation from the provisions laid down in such working plans should be permitted without the Conservator's concurrence, and none should be made unless necessitated by unforeseen events.

22. But it will be a long time before the preparation of working plans for the Madras forests can be undertaken on a large scale, and the present organization must, therefore, be framed for the existing state of things. As already explained in paragraph 19, the work in each district will be regulated by annual plans of operations prepared in close connection with the budgets. Wherever working plans have been framed, these annual plans of operations must be based upon the provisions of the working plans. Where no working plans exist and until such plans have been made, the annual plan of operations must be based on the general principles of forest conservancy. These annual plans will prescribe what work is to be done in the demarcation of boundaries, road-making and other communications, fire-protection, closing forests against grazing, cultural operations, thinning and cutting, and will generally indicate all work that should be done during the year in each forest range of the district. The District Forest Officer will, under the Conservator's advice, frame the plan of operations, which, as already explained, must receive the Collector's approval. The responsibility for carrying out the plan of operations will rest entirely with the Collector, but for such deviations as may be necessitated by unforeseen events, the Conservator's consent must first be obtained.

23. In this manner the Conservator will exercise the needful control in professional matters, and maintain that continuity of action which is necessary. But in the present state of forest administration in this Presidency, it must not be expected that the annual plans of operations will be sufficient. There will be many instances in which the Conservator will find it necessary to communicate with the Collector regarding matters of a professional nature which are not provided for in the annual plans. Hence, it is indispensable that the Conservator should be kept fully informed of all that is going on, and this will enable him at any time to communicate his opinion to the Collector, and, if the matter seems of sufficient importance, to address Government or the Board of Revenue. Eventually each Collector will have at hand a professional officer of high qualifications: this will tend to diminish references by and to the Conservator, and there will then be little danger of action in a wrong direction being taken, or of the Conservator's being unable to make his professional influence felt.

Collectors and District Forest Officers.

24. The District Forest Officer and the subordinates under him must be in the fullest manner under the Collector's orders and control, and the former should receive no orders from any other authority. His head-quarters should be, as a rule, those of the Collector, and, under the control of that officer, he should conduct all the forest business of the district. He will be in the position of Assistant to the Collector in forest matters, and the Collector should give no orders on such matters except through him. On matters of ordinary routine the Collector will authorize the District Forest Officer to issue orders without reference to him, making such arrangements as may be necessary for such orders being reported by means of weekly abstracts. Other matters will be referred to the Collector by means of office notes. The District Forest Officer, being the head of a branch of the Collector's office, should not communicate with the Collector by official letters. He should draw up in his own hand a sufficiently full report or diary of all important business, and send it to the Collector at the close of each week. The Collector, after recording any remarks or instructions he may think fit, should send it on for the Conservator's information, and that officer should return it without delay, noting any remarks or suggestions he may have to offer. It will then go back to the District Forest Officer, the Collector, if he disagrees with the Conservator's remarks or suggestions, informing the District Forest Officer, so as to guard against action being taken of which he disapproves. In such cases he will at once inform the Conservator. When the Conservator is in camp with the District Forest Officer he will, of course, be at liberty freely to communicate to him his views and suggestions on matters of forest administration; but he should inform the Collector in writing of what passes between them. In this way the Conservator will be kept fully and promptly informed of all that goes on, and will have ample opportunity of impressing his views upon the Collectors and District Forest Officers; but all regular official business should be transacted by

the Collector, and the District Forest Officer should not accept or carry out any orders which have not emanated from him.

Position of Conservator.

25. We are sanguine that the plan sketched above will be found to work well in practice, and to fulfil the conditions stated in paragraph 18. It will not, if properly understood and carried out, impose an undue burden of work upon the Collectors, who will merely have to supervise and control the work done by their District Forest Officers. On the other hand, it will relieve the Conservator of much detailed office work, and will enable him to spend, as he should do, at least six months of every year in the forests with the District Civil and Forest Officers. During the remainder of the year, comprising the time when the budgets, the annual plans of operations, and the annual reports are under preparation, he should be at head-quarters and in constant communication with the Board of Revenue and Government. As the professional adviser of these authorities, his opinion will of course carry great weight in the settlement of the annual schemes, and the adjustment of the claims of the several districts on the budget, as well as in all professional questions. The control of the departmental finance and organization, which we propose to reserve to the Conservator, will place him in a sufficiently influential position as head of the department; and this arrangement constitutes an essential difference between our scheme and that adopted in 1872. On the other hand, he will not dictate to Collectors, who will not be in any sense under his orders. In case of difference of opinion, he will endeavour to enforce his views by satisfying the authorities to whom Collectors are subordinate that he is in the right,—a course which he will scarcely take except in cases of importance, and when the Collectors are clearly wrong. There will be no division of power or responsibility. The Conservator will have full control and responsibility in matters of finance and organization; and the Collectors, subject to the orders of the Board of Revenue and Government, will have full executive power; the function of the Conservator in regard to the current working being mainly that of advice. We believe that, in fact, differences of opinion between the Collectors and Conservator will be rare, and we would urge that it is in no way a necessity that they should take opposite views on forest matters. Hereafter when an efficient staff, consisting of superior and subordinate officers who know their profession, and a complete organization have been formed, and when a good forest law and good rules made under it have been brought into operation, it may be possible to make such changes as further experience may suggest. One practical result may, at any rate, be counted on to follow from our scheme, namely, that it will tend to unite the subordinate Civil and Forest establishments; and if this is accomplished, the administration of forests will no longer be considered as a thing apart from the administration of the other Government lands.

Subordinate Officers.

26. We have hitherto said nothing as to the relations between the subordinates of the Revenue and Forest Departments, nor as to the position, in regard to forest administration, which should be assigned to Divisional Officers, that is, Sub-Collectors and Assistants. We do not think it possible or desirable to lay down any definite rules on these subjects, as we are of opinion that it is better to leave them to the discretion of the Collector, who will be responsible for the executive work of forests in his district, and who may be trusted to make the best use he can of the whole agency under his orders. As to Divisional Officers, it is the practice for Collectors to keep them informed of all matters relating to their divisions; and if any Divisional Officer shows particular aptitude or liking for, or desire to co-operate in, forest work, the Collector will no doubt be only too glad to make such arrangements as will admit of his assistance being utilized to the full. As regards Tahsildars and Forest Rangers, we think no definite rule can be laid down. We would only say that reserved forests should be under the exclusive control of Forest Officers; and that the latter should have a voice in regard to the grant for cultivation of any land under conservancy. The alienation on patta of land which, as provided in the Forest Bill, is to be declared reserved, is forbidden; but temporary occupation of such land on lease is permitted, and as regards such leases Forest Officers should have a voice, under such arrangements as the Collector may make. Land not reserved, but to which rules under the Act will be made applicable, may be granted on patta, and we think that darkhasts for these lands (which will be defined and known in all cases) should go to the Tahsildars through the Forest Rangers; and if these officers differ, through the District Forest Officer to the Collector or Divisional Officer, as may be prescribed. Cultivation without darkhast in any land under conservancy should be strictly prohibited; and Village Officers should be held responsible for preventing it, and for bringing it to notice if it occurs. As regards the enforcement of the Conservancy Rules, of course, all officers of Government will co-operate; but no doubt special obligations in this matter will attach to forest subordinates.

There may be some districts in which it may not be expedient to introduce the system here proposed, and in which it may be preferable to invest the Conservator with full control over the forest administration. These, however, will be special and exceptional cases. As a rule, and in most districts the plan here suggested should be introduced.

Prosecutions for Forest offences.

27. Only one other point we think calls for notice. Under the orders of Government quoted in the margin, it has, for some time past, been the practice to report all forest offences to the Collector, and to obtain his sanction before prosecutions are instituted. Assuming that the Forest Bill now submitted becomes law in the shape in which it has been drafted, it will probably not be any longer necessary to retain these orders in force. In most districts the Forest Officer has hitherto occupied a position apart from the district authorities. It was necessary, therefore, that his proceedings in instituting prosecutions should be supervised; but when the Forest Act is in force and the District Forest Officer becomes, as it is proposed he shall become, the Collector's Assistant for forest matters, it will no longer be expedient that this procedure should be continued.

G.O., No. 1148, dated the 3rd June 1878.
" " 528, " the 12th March 1881.
" " 1663, " the 13th Aug. "

28. Under the Bill as drafted, the District Forest Officer has a defined position in regard to forest offences. He will, if he is authorized by Government to do so, be able to hold preliminary enquiries, and to exercise his discretion as to whether he will prosecute an offender, or will accept compensation for the offence and release him, or withdraw any charge which may already have been brought before a Magistrate. If the Collector does not place sufficient confidence in his District Forest Officer to allow him to act in these matters without supervision, it will be open to him to require a report before prosecutions are instituted, but ordinarily it will probably be sufficient if the District Forest Officer's proceedings are reported to the Collector in weekly abstracts.

29. Moreover, when the procedure for dealing with forest offences has been laid down by law, and the punishments which may be inflicted are clearly defined, it will, it is submitted, be unnecessary even for the District Forest Officer to interfere except in cases of importance. In ordinary cases of a trivial character it will suffice, if subject to the control of the District Forest Officer over his subordinates, and that of the District Magistrate over the Subordinate Magistrates and Police, the law be allowed to take its course.

Conclusion.

30. The suggestions submitted in this report relate, *first*, to the amalgamation of Jungle Conservancy with Forest administration, and, *second*, to the relations of Civil and Forest Officers. In regard to the second point, it may be useful to recapitulate our proposals. Subject to the control of Government, the Collector will carry on the current business of forest administration in his district, and in this he will, as far as practicable, be guided by the advice of the Conservator, who will be held responsible for the formation and maintenance of efficient establishments, and for all professional and financial matters. The District Forest Officer will receive all his orders from the Collector, and the Conservator will have no authority to issue direct orders to the District Forest Officer. The Conservator will be the adviser both of Government and the Collectors, and certain definite powers will be given to him in regard to those branches of business for which he is held responsible. Accordingly, the Conservator will spend part of his time at the head-quarters of Government, and part on his inspection tours in travelling through the forests with Collectors and District Forest Officers. Throughout the year he will be kept promptly informed of all that goes on in each district by means of the District Forest Officers' weekly reports. While on tour he will embody the result of his inspections in notes or other communications, which will be addressed to the Collector, and which will not necessarily be submitted for orders to the Government or to the Board of Revenue. It is acknowledged on all sides that the system, which has existed for some time, under which no action was taken on the Conservator's inspection reports until they had been considered by the Board of Revenue and Government, has not tended to favor progress in forest administration. As far as the Collector sees fit to do so, he should authorize the District Forest Officer to take action at once on the Conservator's inspection reports and on other communications from that officer, and a reference to higher authority should only be made in those cases in which the Collector and Conservator are unable to reconcile their views. Action must be prompt and continuous, otherwise no progress will be made in the work. There is no reason why these inspection reports should not, if so desired, be sent to Government for information; but, as a rule, and subject to the prescribed course in case of difference of opinion, action should be taken upon them by the Collector, as far as he is competent or sees fit to do so.

31. If the suggestions here submitted are accepted, and if the Forest Act is passed as proposed, it will be found that there will be no uncertainty regarding the relative functions of Government, the Board of Revenue, the Collector, the Conservator and the District Forest Officer. They are clearly defined by the provisions of the Bill, by the existing rules regarding sanction of establishment and expenditure generally, and by the suggestions of the present report.

We have considered whether we should append a set of rules to this report, but have decided not to do so. The plan submitted by us for the consideration of Government must first be worked out and developed by actual experience, before an attempt can be made to regulate

business by a rigid set of rules. The chief point which we desire to urge is, that Collectors and the Conservator should cordially co-operate in the matter of forest administration. If this point is fully understood and acted upon, Collectors and the Conservator will find no difficulty in adapting their action to the requirements of the case. We are of opinion that at the outset the system must be elastic. Rigid rules prematurely introduced will rather impede business if found inapplicable. After the system has been perfected by actual experience, it will then be possible and most useful to draw up a set of rules.

W. S. WHITESIDE, *Collector of North Arcot.*
W. LOGAN, *Collector of Malabar.*
H. E. STOKES, *Collector of Salem.*
D. BRANDIS, *Inspector-General of Forests, on special duty.*
J. CAMPBELL-WALKER, Major, *Conservator of Forests.*

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THE MADRAS FOREST ACT, 1882.

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MADRAS ACT No. V OF 1882.

An Act to make provision for the Protection and Management of Forests in the Presidency of Madras.

Preamble.

WHEREAS it is expedient to make provision for the protection and management of Forests in the Presidency of Madras; It is hereby enacted as follows:—

CHAPTER I.

Preliminary.

Short title.

1. This Act may be called "The Madras Forest Act, 1882."

Local extent.

It extends to all territories for the time being subject to the Government of Fort St. George, except the Scheduled Districts, provided that the Governor in Council may, by Notification in the *Fort St. George Gazette*, exempt any place from the operation of the whole or any portion of this Act, but not so as to affect any thing done,

or any offence committed, or any fine or penalty incurred, or any proceedings commenced in such place before such exemption, and may in like manner vary or cancel such Notification;

Commencement. and it shall come into force on such day as the Governor in Council may, by Notification in the *Fort St. George Gazette*, direct.

Interpretation-clause. 2. In this Act, and in all Rules made hereunder, unless there is something repugnant in the subject or context,—

"Government:" "Government" means the Governor of Fort St. George in Council:

"Collector:" "Collector" means the chief executive Revenue Officer of a district:

"Forest Officer:" "Forest Officer" means any person appointed by name or as holding an office by or under the orders of the Government to be—

a Conservator, Deputy Conservator, Assistant Conservator, Sub-Assistant Conservator, Forest Ranger, Forester, Forest Guard:

or to discharge any function of a Forest Officer under this Act or any Rule made hereunder:

"District Forest Officer:" "District Forest Officer" means the chief Forest Officer of a district or of a portion of a district, if in independent charge of such portion:

"Tree:" "Tree" includes stumps, bamboos and brushwood:

"Timber:" "Timber" includes trees when they have fallen or have been felled, and all wood, whether cut up or fashioned or hollowed out for any purpose or not:

"Forest produce:" "Forest produce" includes the following things when found in, or brought from, a forest (that is to say):—

minerals (including limestone and laterite), surface-soil, trees, timber, plants, grass, peat, canes, creepers, reeds, fibres, leaves, moss, flowers, fruits, seeds, roots, galls, spices, juice, catechu, bark, caoutchouc, gum, wood oil, resin, varnish, lac, charcoal, honey and wax, skins, tusks, bones and horns:

"Forest offence:" "Forest offence" means an offence punishable under this Act or any Rule made hereunder:

"Cattle:" "Cattle" includes elephants, camels, buffaloes, horses, mares, ponies, colts, fillies, mules, asses, pigs, rams, ewes, sheep, lambs, goats and kids:

"River:" "River" includes streams, canals, creeks and other channels, natural or artificial:

"Land at the disposal of Government:" "Land at the disposal of Government" includes all unoccupied land, whether assessed or unassessed; but does not include land the property of landholders as defined by Section one of Act VIII of 1865, Madras, (namely) all persons holding under a sanad-i-milkíyat-i-istimrár, all other zamíndárs, shrotriyamdárs, jágírdárs, inámdárs, and all persons farming lands from the above persons or farming the land revenue under Government: also all holders of land under raiyatwár settlements, or in any way subject to the payment of land revenue direct to Government, and all other registered holders of land in proprietary right.

"Magistrate:" "Magistrate" means a Magistrate of the first or second class and includes a Magistrate of the third class when he is specially empowered by Government to try forest offences:

"Imprisonment:" "Imprisonment" means imprisonment of either description, as defined in the Indian Penal Code.

CHAPTER II.

Reserved Forests.

Power to reserve forests. 3. The Governor in Council may constitute any land at the disposal of Government a reserved forest in the manner hereinafter provided.

Notification by the Governor in Council. 4. Whenever it is proposed to constitute any land a reserved forest, the Governor in Council shall publish a Notification in the *Fort St. George Gazette* and in the official Gazette of the district—

(*a*) specifying, as nearly as possible, the situation and limits of such land;
(*b*) declaring that it is proposed to constitute such land a reserved forest;
(*c*) appointing an officer (hereinafter called the Forest Settlement Officer) to enquire into and determine the existence, nature and extent, of any rights claimed by, or alleged to exist in favor of, any person in or over any land comprised within such limits, or to any forest produce of such land, and to deal with the same as provided in this chapter.

The officer appointed under clause (*c*) of this section shall ordinarily be a person other than a Forest Officer; but a Forest Officer may be appointed by the Governor in Council to attend on behalf of Government at the enquiry prescribed by this chapter.

5. Except as hereinafter provided, no Civil Court shall, between the dates of the publication of the Notification under Section four and of the Notification to be issued under Section sixteen, entertain any suit to establish any right in or over any land, or to the forest produce of any land, included in the Notification, published under Section four.

Suits barred.

6. When a Notification has been issued under Section four, the Forest Settlement Officer shall publish in the official Gazette of the district, and at the headquarters of each taluk in which any portion of the land included in such Notification is situate, and in every town and village in the neighbourhood of such land, a Proclamation—

Proclamation by Forest Settlement Officer.

(*a*) specifying, as nearly as possible, the situation and limits of the land proposed to be included within the reserved forest;

(*b*) setting forth the substance of the provisions of Section seven;

(*c*) explaining the consequences which, as hereinafter provided, will ensue on the reservation of such forest; and,

(*d*) fixing a period of not less than three months from the date of publishing such Proclamation in the official Gazette of the district and requiring every person claiming any right referred to in Section four, either to present to such officer, within such period, a written notice specifying, or to appear before him within such period and state, the nature of such right, and in either case to produce all documents in support thereof.

The Forest Settlement Officer shall also serve a notice to the same effect on every known or reputed owner or occupier of any land included in or adjoining the land proposed to be constituted a reserved forest, or on his recognized agent or manager. Such notice may be sent by registered post to persons residing beyond the limits of the district in which such land is situate.

7. During the interval between the publication of such Proclamation and the date fixed by the Notification under Section sixteen

Bar of accrual of forest rights.

no right shall be acquired in or over the land included in such Proclamation, except under a grant or contract in writing made or entered into by, or on behalf of, the Government, or by or on behalf of some person in whom such right, or power to create the same, was vested when the Proclamation was published, or by succession from such person,

and no fresh clearings for cultivation or for any other purpose shall be made on such land. No patta shall, without the previous sanction of the Governor in Council, be granted on behalf of Government in such land, and every patta granted without such sanction shall be null and void.

Prohibition of clearings, &c.

Nothing in this section shall be deemed to prohibit any act done with the permission in writing of the Forest Settlement Officer.

8. The Forest Settlement Officer shall take down in writing all statements made under Section six, and shall enquire into all claims made under that section, recording the evidence in the manner prescribed by the Code of Civil Procedure in appealable cases. The Forest Settlement Officer shall at the same time consider and record any objection which the Forest Officer (if any) appointed under Section four may make to any such claim.

Enquiry by Forest Settlement Officer.

9. For the purpose of such enquiry, the Forest Settlement Officer may exercise the following powers (that is to say) :—

Powers of Forest Settlement Officer.

(*a*) power to enter, by himself or any officer authorized by him for the purpose, upon any land, and to survey, demarcate and make a map of the same; and

(*b*) the powers conferred on a Civil Court by the Code of Civil Procedure for compelling the attendance of witnesses and the production of documents.

10. In the case of a claim to a right in or over any land other than the following rights :—

Claims to rights of occupancy and ownership.

(*a*) a right of way;

(*b*) a right to a water-course, or to use of water;

(*c*) a right of pasture, or

(*d*) a right to forest produce;

the Forest Settlement Officer shall pass an order specifying the particulars of such claim and admitting or rejecting the same wholly or in part.

i. If such claim is admitted wholly or in part, the Forest Settlement Officer may (1) come to an agreement with the claimant for the surrender of the right; or (2) exclude the land from the limits of the proposed forest; or (3) proceed to acquire such land in the manner provided by the Land Acquisition Act, 1870.

Admitted claims.

For the purpose of so acquiring such land—

(*i*) the Forest Settlement Officer shall be deemed to be a Collector proceeding under the Land Acquisition Act, 1870;

(ii) the claimant shall be deemed to be a person interested and appearing before him in pursuance of a notice given under Section nine of that Act;

(iii) the provisions of the preceding sections of that Act shall be deemed to have been complied with ; and

(iv) the Forest Settlement Officer with the consent of the claimant, or the Court (as defined in the said Act) with the consent of the claimant and of the Collector of the district, may award compensation by the grant of rights in or over land, or by the payment of money, or both.

Rejected claims—Appeals.

ii. If such claim is rejected wholly or in part, the claimant may, within thirty days from the date of the order, prefer an appeal to the District Court in respect of such rejection only. Provided that the Governor in Council may, on just and reasonable cause for the same being shown, extend the period for such appeal within such further period as may seem proper, and an order or endorsement under the signature of one of the Secretaries to Government shall be sufficient authority for the said Court to entertain such appeal beyond the limit above specified. If the Court decides that the claim or such part thereof as has been rejected should be admitted, the Forest Settlement Officer shall proceed to deal with it in like manner as if it had been in the first instance admitted by himself.

iii. When a claim has been admitted in the first instance wholly or in part, a like appeal may be preferred on behalf of Government by the Forest Officer appointed under Section four, or other person generally or specially empowered by the Government in this behalf.

Claims to rights of way, water-course, pasture, and to forest produce.

11. In the case of a claim to rights of the kind specified in clauses (*a*), (*b*), (*c*) and (*d*) of Section ten, the Forest Settlement Officer shall pass an order specifying the particulars of such claim as far as may be necessary to define the nature, incidents and extent of the rights claimed, and admitting or rejecting such claim wholly or in part.

When a claim to any such right is admitted, if the right is for the beneficial enjoyment of any land or buildings, he shall record the designation, position and area of such land, and the designation and position of such buildings.

Where the right is a right to forest produce, he shall also record whether the forest produce obtained by the exercise of such right may be sold or bartered.

Provision for rights of pasture or to forest produce admitted.

12. When the Forest Settlement Officer has admitted wholly or in part, and recorded under Section eleven, a claim to a right of pasture or to forest produce, he shall, as far as possible, provide for the exercise of such right—

(*a*) by altering the limits of the proposed reserved forest so as to exclude land of sufficient extent, of a suitable kind, and in a locality reasonably convenient for the purposes of the claimant ;

(*b*) by recording an order continuing to the claimant a right of pasture or to forest produce (as the case may be), subject to such rules as may be prescribed by the Governor in Council.

The order passed under clause (*b*) shall record, as far as practicable, the number and description of the cattle which the claimant is from time to time entitled to graze, the local limits within which, and the seasons during which, such pasture is permitted; or

the quantity of timber or other forest produce which the claimant is authorised to take or receive, the local limits within which, the season during which, and the mode in which, the taking of such produce is permitted; and

such other particulars as may be required in order to define the extent of the right which is continued, and the mode in which it may be exercised.

Commutation of such rights.

13. Whenever any right of pasture or to forest produce admitted under Section eleven is not provided for in one of the ways prescribed in Section twelve, the Forest Settlement Officer shall, subject to such rules as the Government may prescribe in this behalf, commute such right by paying a sum of money in lieu thereof, or, with the consent of the claimant, by the grant of rights in or over land or in such other manner as such officer thinks fit.

Appeal from order passed under Sections 11, 12 and 13.

14. The claimant, or the Forest Officer appointed under Section four, or any other person generally or specially empowered by the Government in this behalf, may, within sixty days from the date of any order passed by the Forest Settlement Officer under Sections eleven, twelve, and thirteen, present an appeal from such order

to a Forest Court constituted as hereinafter provided, or,

where no such Court is constituted, to such officer of the Revenue Department of not less than twelve years' standing as the Governor in Council may, from time to time, by Notification in the *Fort St. George Gazette*, appoint by name or as holding an office, to hear appeals from such orders.

In disposing of such appeals the Revenue Officer appointed as aforesaid shall be guided by the provisions of Sections thirty-nine and forty of this Act.

Appeal under Section fourteen.

15. Every appeal under Section fourteen shall be made by petition in writing, and may be delivered to the Forest Settlement Officer, who shall forward it without delay to the appellate authority.

Notification declaring forest reserved.

16. When the following events have occurred (viz.):—

(*a*) the period fixed under Section six for preferring claims has elapsed, and all claims (if any) made within such period have been disposed of by the Forest Settlement Officer; and

(*b*) if such claims have been made, the period fixed by Sections ten and fourteen for appealing from the orders passed on such claims has elapsed, and all appeals (if any) presented within such period have been disposed of by the appellate authority; and

(*c*) all proceedings prescribed by Section ten have been taken, and all lands (if any) to be included in the proposed forest, which the Forest Settlement Officer has, under Section ten, elected to acquire under the Land Acquisition Act, 1870, have become vested in the Government under Section sixteen of that Act;

the Governor in Council may publish a Notification in the *Fort St. George Gazette*, specifying the limits of the forest which it is intended to reserve, and declaring the same to be reserved from a date to be fixed by such Notification.

The Forest Settlement Officer shall, before the date so fixed, publish such Notification in the manner prescribed for the Proclamation under Section six.

From the date so fixed, such forest shall be deemed to be a reserved forest.

Extinction of rights not claimed.

17. Rights in respect of which no claim has been preferred under Section six shall thereupon be extinguished, unless, before the publication of such Notification, the person claiming them has satisfied the Forest Settlement Officer that he had sufficient cause for not preferring such claim within the period fixed under Section six; in which case the Forest Settlement Officer shall proceed to dispose of the claim in the manner hereinbefore provided.

No right acquired over reserved forest except as here provided.

18. No right of any description shall be acquired in or over a reserved forest, except under a grant or contract in writing made by or on behalf of the Government, or by or on behalf of some person in whom such right, or the power to create such right, was vested when the Notification under Section sixteen was published or by succession from such person:

Provided that no patta shall, without the previous sanction of the Governor in Council, be granted on behalf of Government for any land included within a reserved forest, and every patta granted without such sanction shall be null and void.

Rights continued under Section 12 not to be alienated without sanction.

19. Notwithstanding anything herein contained, no right continued under Section twelve shall be alienated by way of grant, sale, lease, mortgage or otherwise, without the sanction of the Government: provided that, when any such right is continued for the beneficial enjoyment of any land or buildings, it may be sold or otherwise alienated with such land or buildings without such sanction. Any alienation of such right in contravention of this section shall be null and void.

No forest produce obtained in exercise of any right continued under Section twelve shall be sold or bartered except to the extent defined by the order recorded under Sections eleven and twelve.

Any person selling or bartering any forest produce in contravention of this section shall be punished with fine which may extend to two hundred rupees.

Power to stop ways and water-courses in reserved forest.

20. The District Forest Officer may, from time to time, with the previous sanction of the Government, stop any public or private way or water-course in a reserved forest: provided that a reasonably convenient substitute for the way or water-course so stopped already exists, or has been provided or constructed in lieu thereof.

Penalties for trespass or damage in reserved forests, and acts prohibited in such forests.

21. Any person who—

(*a*) makes any fresh clearing prohibited by Section seven; or

(*b*) sets fire to a reserved forest, or kindles, or leaves burning, any fire in such manner as to endanger the same;

or who, in a reserved forest,

(*c*) kindles, keeps, or carries any fire except at such seasons and in such manner as the District Forest Officer may from time to time notify;

(*d*) trespasses, or pastures cattle, or permits cattle to trespass;

(*e*) fells, girdles, marks, lops, taps, uproots or burns any tree, or strips off the bark or leaves from, or otherwise damages, the same;

(*f*) quarries stone, burns lime or charcoal, or collects, subjects to any manufacturing process, or removes any forest produce;

(*g*) clears, cultivates or breaks up any land for cultivation or any other purpose; or,

(*h*) in contravention of any rules made by the Governor in Council, hunts, shoots, fishes, poisons water or sets traps or snares;

(*i*) damages, alters or removes any wall, ditch, embankment, fence, hedge or railing;

shall be punished with imprisonment for a term which may extend to six months, or with fine which may extend to five hundred rupees, or with both, in addition to such compensation for damage done to the forest as the convicting Court may direct to be paid.

Nothing in this section shall be deemed to prohibit

Acts exempted from prohibition contained in this section.

(*a*) any act done in accordance with any rule made by the Government, or with the permission in writing of the District Forest Officer, or of an officer authorised by him to grant such permission; or

(*b*) the exercise of any right continued under Section twelve or created by grant or contract in the manner described in Section eighteen.

Provided that this section shall not be held to interfere with such working of the forest as may be ordered by the District Forest Officer.

Suspension of rights in reserved forests.

22. Whenever fire is caused wilfully or negligently in a reserved forest, the Government may (notwithstanding that a penalty has been inflicted under Section twenty-one) direct that in such forest or any portion thereof the exercise of all rights of pasture or to forest produce shall be suspended for such period as it thinks fit.

Persons bound to assist Forest Officer and Police Officer.

23. Every person who exercises any right in a reserved forest, or who is permitted to take any forest produce from, or to cut and remove timber or to pasture cattle in, such forest; and

every person who is employed by any such person in such forest; and

every village officer or person in any village contiguous to such forest who is employed by the Government;

shall be bound to furnish without unnecessary delay to the nearest Forest Officer or Police Station-House Officer any information he may possess respecting the occurrence of a fire in or near such forest, or the commission of, or intention to commit, any forest offence; and shall assist any Forest Officer or Police Officer demanding his aid—

(*a*) in extinguishing any fire occurring in such forest;

(*b*) in preventing any fire which may occur in the vicinity of such forest from spreading to such forest;

(*c*) in preventing the commission in such forest of any forest offence; and,

(*d*) when there is reason to believe that any such offence has been committed in such forest, in discovering and arresting the offender.

Power to declare forest no longer reserved.

24. The Government may, with the previous sanction of the Governor-General in Council, by Notification in the *Fort St. George Gazette*, direct that, from a date to be fixed by such Notification, any forest or any portion thereof reserved under this Act shall cease to be reserved.

From the date so fixed, such forest or portion shall cease to be reserved; but the rights (if any) which have been extinguished therein shall not revive in consequence of such cessation.

Forests reserved previous to the passing of this Act.

25. The Government may, by Notification in the *Fort St. George Gazette*, declare any forest which has been reserved by order of the Government previous to the day on which this Act comes into force, to be a reserved forest under this Act:

Provided that if the rights of the Government or of private persons to or over any land or forest produce in such forest have not been enquired into, settled and recorded in a manner which the Government thinks sufficient, the same shall be enquired into, settled and recorded in the manner provided by this Act for reserved forests, before the date on which the Notification declaring the forest to be reserved takes effect.

All questions decided, orders issued and records prepared in connection with the reservation of such forest shall be deemed to have been decided, issued and prepared hereunder, and the provisions of this Act relating to reserved forests shall apply to such forest.

CHAPTER III.

Protection of Land at the disposal of Government not included in Reserved Forests.

Power to make rules.

26. Subject to all rights now legally vested in individuals and communities, the Governor in Council may for any district or portion of a district make rules to regulate the use of the pasturage or of the natural produce of land at

the disposal of Government and not included in a reserved forest. Such rules may, with respect to such land—

(*a*) regulate or prohibit the clearing or breaking up of land for cultivation or other purposes ;

(*b*) regulate or prohibit the kindling of fires, and prescribe the precautions to be taken to prevent the spreading of fires ;

(*c*) regulate or prohibit the cutting, sawing, conversion and removal of trees and timber, and the collection and removal of natural produce ;

(*d*) regulate or prohibit the quarrying of stone, the boiling of catechu, or the burning of lime or charcoal ;

(*e*) regulate or prohibit the cutting of grass and pasturing of cattle, and regulate the payments (if any) to be made for such cutting or pasturing ;

(*f*) regulate or prohibit hunting, shooting, fishing, poisoning water and setting traps or snares ;

(*g*) regulate the sale or free grant of timber or other natural produce ; and

(*h*) prescribe the fees, royalties or other payments for such timber or other natural produce, and the manner in which such fees, royalties or other payments shall be levied.

Penalties for acts in contravention of rules.

The Governor in Council may by such rules prescribe, as penalties for the infringement thereof, imprisonment for a term which may extend to one month, or fine which may extend to two hundred rupees, or both.

Provided that the Governor in Council may exempt any person or class of persons from the operation of all or any of such rules.

Power to close land against pasture.

27. Whenever fire is caused wilfully or negligently in any land to which all or any of the rules made under Section twenty-six have been extended, the Government may, notwithstanding that a penalty has been inflicted under that section, direct that such land be closed against pasture for such period as it thinks fit :

Provided that an area sufficient in extent and in a locality reasonably convenient is left open for the use of persons having rights of pasture in such land.

Penalties.

28. Whoever pastures cattle or permits cattle to trespass in land closed under Section twenty-seven shall be punished with imprisonment for a term which may extend to one month, or with fine which may extend to two hundred rupees, or with both.

CHAPTER IV.

Of the Control over Forests and Lands not at the disposal of Government or in which Government has a limited Interest.

On certain lands, the breaking up or clearing for cultivation, &c. may be regulated or prohibited.

29. The Governor in Council may from time to time, by Notification in the *Fort St. George Gazette* and in the official Gazettes of the districts affected thereby, regulate or prohibit in any forest or waste land not at the disposal of Government

(*a*) the breaking up or clearing of land for cultivation ;

(*b*) the pasturing of cattle ;

(*c*) the firing or clearing of the vegetation ;

when such regulation or prohibition appears to be necessary for any of the following purposes :

First.—For protection against storms, winds, rolling stones, floods and avalanches ;

Second.—For the preservation of the soil on the ridges and slopes, and in the valleys, of hilly tracts, the prevention of landslips and of the formation of ravines and torrents, and the protection of land against erosion, or the deposit thereon of sand, stones or gravel ;

Third.—For the maintenance of a water-supply in springs, rivers and tanks ;

Fourth.—For the protection of roads, bridges, railways and other lines of communication ;

Fifth.—For the preservation of the public health ;

and may alter or cancel such Notification.

The Government may, for any such purpose, construct at their own expense, in or upon any such forest or land, such works as they think fit :

Provided that no such Notification shall be made or work begun until after the issue of a notice to the owner of such forest or land, calling upon him to show cause, within a reasonable period to be specified in such notice, why such Notification should not be made or work constructed, and until his objections (if any) and any evidence he may produce in support of the same have been heard by an officer duly appointed in that behalf, and have been considered by the Government.

30. Whenever the owner of such forest or land may decline to comply with the regulations or directions contained in the said Notification, it shall be incumbent upon the Government, if they resolve to assume control of the said forest or land, to take the said forest or land, or so much of it as they may see fit, on lease from the owner for such term as they may deem it necessary to retain the same under control, and the owner shall be bound either to conclude such lease with the Government or to require that such forest or land shall be acquired for public purposes, and in the latter event the Government shall acquire such forest or land accordingly. If such lease is agreed upon, the amount of annual rent to be reserved, and all other questions arising between the owner or persons claiming to be owners and the Government, shall, in case of dispute, be determined in accordance, so far as may be, with the provisions of the Land Acquisition Act, 1870.

In case of refusal by owner, Government may take such lands on lease, or acquire them.

31. In any case under this chapter in which the Government consider that, in lieu of taking the forest or land under its control, the same should be acquired for public purposes, the Government may proceed to acquire it in the manner prescribed by the Land Acquisition Act, 1870.

Acquisition of forest or land under the Land Acquisition Act.

32. The owner of any land or, if there be more than one owner thereof, the owners of shares therein, whether divided or not, amounting in the aggregate to at least two-thirds thereof, may, with a view to the formation or conservation of forests thereon, represent in writing to the Collector their desire—

Protection of forests at request of owners.

(*a*) that such land be managed on their behalf by the District Forest Officer, as a reserved forest, on such terms as may be agreed upon; or

(*b*) that such land be managed, subject to the control of the Collector, by a person appointed by themselves and approved by the Collector; or

(*c*) that all, or any of the provisions of this Act or rules made thereunder be applied to such land.

The Government may in any such case, by Notification in the *Fort St. George Gazette*, apply to such land such provisions of this Act as it thinks suitable to the circumstances thereof and as may be desired by the applicants.

Any such Notification may be altered or cancelled by a like Notification.

33. If the Government and any person or persons are jointly interested in any forest or waste-land, or in the whole or any part of the produce thereof, the Government may either—

Management of forests the joint property of Government and other persons.

(*a*) undertake the management of such forest, waste-land or produce, accounting to such person for his interest in the same; or

(*b*) issue such regulations for the management of the forest, waste-land or produce by the persons so jointly interested, as it deems necessary for the management thereof and the interests of all parties therein.

When the Government undertakes, under clause (*a*) of this section, the management of any forest, waste-land or produce, it may by Notification in the *Fort St. George Gazette* and in the official Gazette of the district, declare that any of the provisions contained in Chapters II and III of this Act shall apply to such forest, waste-land or produce, and thereupon such provisions shall apply accordingly.

34. All persons employed under Sections thirty, thirty-two and thirty-three to carry out the provisions of this Act shall be deemed to be Forest Officers within the meaning of this Act.

Persons employed to carry out the Act to be deemed Forest Officers.

CHAPTER V.

Control of Timber in Transit.

35. The Governor in Council may make rules to regulate the transit of all timber or of certain classes of timber within local limits as may appear to be necessary. Such rules may (among other matters)—

Power to make rules to regulate transit of timber.

(*a*) prescribe the routes by which alone timber may be imported into and exported from the Presidency of Madras;

(*b*) prohibit the import and export or moving within defined local limits of timber without a pass from the landholder from whose lands it was brought, or from an officer duly authorised to issue the same, or otherwise than in accordance with the conditions of such pass;

(*c*) prescribe the form of such passes and provide for their issue, production, and return;

(*d*) provide for the stoppage, reporting, examination and marking of timber in transit within defined local limits or at stations established as hereinafter provided;

(*e*) establish, or authorise the Collector to establish, stations to which such timber shall be taken by those in charge of it for examination, or marking; and the conditions under which such timber shall be brought to, stored at, and removed from, such station;

(*f*) provide for the management and control of such stations, and for regulating the appointment and duties of persons employed thereat;

(*g*) authorise the transport of timber, the property of Government, across any land, and provide for the payment of compensation for any damage done by the transport of such timber;

(*h*) prohibit the closing up or obstructing of the channel or banks of any river used for the transit of timber or other forest produce, and the throwing of grass, brushwood, branches and leaves into any such river, or any act which may cause such river to be closed or obstructed;

(*i*) provide for the prevention and removal of any obstruction of the channel or banks of any such river, and for recovering the cost of such prevention or removal from the person, or by the sale of any timber causing such obstruction;

(*j*) provide for the protection of bridges, locks or other public works, by regulating the floating of timber, and the storing of timber on river banks, and by authorising the seizure of timber floated or stored in contravention of such rules or by which any damage to such works may have been caused, and the detention and disposal of such timber until compensation has been made for the damage done;

(*k*) regulate the use of property-marks for timber and the registration of such marks; declare the circumstances in which the registration of any property-marks may be refused or cancelled; prescribe the time for which such registration shall hold good; limit the number of such marks that may be registered by any one person; and provide for the levy of fees for such registration.

Penalties for breach of rules made under Section thirty-five.

36. The Government may, by such rules, prescribe as penalties for the infringement thereof, imprisonment for a term which may extend to one month, or fine which may extend to two hundred rupees, or both.

In cases where the offence is committed after sunset and before sunrise, or after making preparation for resistance to the execution of any law or any legal process, or where the offender has been previously convicted of a like offence, the convicting Magistrate may inflict double the penalty prescribed for such offence.

CHAPTER VI.

The Forest Court.

Appointment and constitution of the Forest Court.

37. Where no Revenue Officer has been appointed to hear appeals under Section fourteen the Governor in Council shall from time to time, as occasion may arise, appoint a Forest Court to hear such appeals. The Court shall consist of three members, of whom

one shall be the Judge of the Court of any district in which any portion of the land, the rights in or over which are in dispute, is situated, or the officer presiding in the principal Civil Court of original jurisdiction of such district,

another shall be the Collector of any such district, or an officer of the Revenue Department of not less than twelve years' standing,

and the third member shall be a person specially selected by the Governor in Council, not holding an office of profit in the service of the Government.

The Judge appointed to be the President.

38. The Judge appointed a member as aforesaid shall be the President of the said Court, and shall make all such orders in the case as may be necessary prior to the hearing of the appeal.

The official members of the Court may be appointed by name or as holding an office.

Hearing of appeals.

39. For the hearing of appeals, the Forest Court shall fix a day and a convenient place in the neighbourhood of the land regarding which, or regarding rights over which, a dispute exists and shall give notice thereof to the parties.

All cases before the Forest Court shall be heard and disposed of, so far as may be, in accordance with the provisions of the Code of Civil Procedure.

Provided that if, on the hearing of any such case, any question of law or of usage having the force of law, or the construction of a document affecting the merits of the case, shall arise on which the Court shall entertain reasonable doubts, the Court may, either of its own motion, or on the application of any of the parties, draw up a statement of the case, and submit it, with its own opinion, for the opinion of the High Court.

And it shall be the duty of the Forest Court to make such reference to the High Court if the question involve any principle of general importance, or affect the rights of a class.

Court to pass orders which shall be final.

40. At the conclusion of the enquiry, and after receipt of the order of the High Court (which shall be binding upon the Forest Court) upon the reference (if any) prescribed by the preceding section, the Forest Court shall proceed to pass such order in the case as it may consider just and proper; and the order passed by the said Court or by the majority of the members of the said Court shall be final.

CHAPTER VII.

Penalties and Procedure.

Seizure of property liable to confiscation.

41. When there is reason to believe that a forest offence has been committed in respect of any timber or forest produce, such timber or produce, together with all tools, ropes, chains, boats, carts and cattle used in committing any such offence, may be seized by any Forest Officer or Police Officer.

Report to Magistrate.

Every officer seizing any property under this section shall place on such property, or the receptacle (if any) in which it is contained, a mark indicating that the same has been so seized, and shall, as soon as may be, make a report of such seizure to the Magistrate having jurisdiction to try the offence on account of which the seizure has been made:

Provided that when the timber or forest produce with respect to which such offence is believed to have been committed is the property of Government and the offender is unknown, it shall be sufficient if the officer makes, as soon as may be, a report of the circumstances to his official superior.

Procedure thereupon.

42. Upon the receipt of any such report, the Magistrate shall take such measures as may be necessary for the trial of the accused and the disposal of the property according to law.

Timber, forest produce, tools, &c., when liable to confiscation.

43. When any person is convicted of a forest offence, all timber or forest produce in respect of which such offence has been committed, and all tools, ropes, chains, boats, carts and cattle used in committing such offence, shall be liable, by order of the convicting Magistrate, to confiscation.

Such confiscation may be in addition to any other other punishment prescribed for such offence.

Disposal on conclusion of trial for forest offence, of produce in respect of which it was committed.

44. When the trial of any forest offence is concluded, any timber or forest produce in respect of which such offence has been committed shall, if it is the property of Government or has been confiscated, be taken possession of by or under the authority of the District Forest Officer; and in any other case may be disposed of in such manner as the Court may order.

Procedure when offender is not known or cannot be found.

45. When the offender is not known or cannot be found, the Magistrate, if he is of opinion that an offence has been committed, may, on application in this behalf, order the property in respect of which the offence has been committed to be confiscated and taken possession of by or under the authority of the District Forest Officer, or to be made over to any person whom the Magistrate considers to be entitled to the same:

Provided that no such order shall be made until the expiration of one month from the date of seizing such property, or without hearing the person (if any) claiming any right thereto, and the evidence (if any) which he may produce in support of his claim.

The Magistrate shall cause a notice of any application under this section to be served upon any person whom he has reason to believe is interested in the property seized, or shall publish such notice in any way which he thinks fit.

Procedure as to perishable property seized under Section forty-one.

46. The Magistrate may, notwithstanding anything hereinbefore contained, direct the sale of any property seized under Section forty-one and subject to speedy and natural decay, and may deal with the proceeds as he might have dealt with such property if it had not been sold.

Appeal from orders under Section forty-three, forty-four or forty-five.

47. Any person claiming to be interested in property seized under Section forty-one may, within one month from the date of any order passed under Section forty-three, forty-four or forty-five, present an appeal therefrom, which may be disposed of in the manner provided by Section 419, Code of Criminal Procedure.

Property when to vest in Government.

48. When an order for the confiscation of any property has been passed under Section forty-three or forty-five, and the period limited by Section forty-seven for presenting an appeal from such order has elapsed, and no such appeal has been presented, or when on such an appeal being presented the

Appellate Court confirms such order in respect of the whole or a portion of such property, such property or portion, as the case may be, shall vest in the Government free from all incumbrances.

Saving of power to release property seized.

49. Nothing hereinbefore contained shall be deemed to prevent the District Forest Officer from directing at any time the immediate release of any property seized under Section forty-one and the withdrawal of any charge made in respect of such property.

Penalty for counterfeiting or defacing marks on trees and timber, and for altering boundary-marks.

50. Whoever, with intent to cause damage or injury to the public or to any person, or to cause wrongful gain as defined in the Indian Penal Code—

(*a*) knowingly counterfeits upon any timber or standing tree a mark used by Forest Officers to indicate that such timber or tree is the property of the Government or of some person, or that it may lawfully be cut or removed by some person; or

(*b*) unlawfully affixes to any timber or standing tree a mark used by Forest Officers; or

(*c*) alters, defaces or obliterates any such mark placed on any timber or standing tree by or under the authority of a Forest Officer; or

(*d*) alters, moves, destroys or defaces any boundary-mark of any forest or any land to which any provisions of this Act apply;

shall be punished with imprisonment for a term which may extend to two years, or with fine which may extend to one thousand rupees, or with both.

Power to arrest without warrant.

51. Any Forest Officer or Police Officer may, without orders from a Magistrate and without a warrant, arrest any person reasonably suspected of having been concerned in any forest offence punishable with imprisonment for one month or upwards, if such person refuses to give his name and residence, or gives a name or residence which there is reason to believe to be false, or if there is reason to believe he will abscond.

Every officer making an arrest under this section shall, without unnecessary delay, take or send the person arrested to the nearest police station, and the officer in charge of such station shall thereupon act according to law.

Punishment for wrongful seizure or arrest.

52. Any Forest Officer or Police Officer who vexatiously and unnecessarily seizes any property on pretence of seizing property liable to confiscation under this Act, or who vexatiously and unnecessarily arrests any person, shall be punished with imprisonment for a term which may extend to six months, or with fine which may extend to five hundred rupees, or with both.

Power to prevent commission of offence.

53. Every Forest Officer and Police Officer shall prevent, and may interfere for the purpose of preventing, the commission of any forest offence.

Operation of other laws not barred.

54. Nothing in this Act shall be deemed to prevent any person from being prosecuted under any other law for any act or omission which constitutes a forest offence, or from being liable under such other law to any higher punishment or penalty than that provided by this Act or the rules made thereunder: Provided that no person shall be punished twice for the same offence.

Power to compound offences.

55. Any Forest Officer specially empowered in this behalf may accept from any person reasonably suspected of having committed any forest offence other than an offence under Section fifty or Section fifty-two a sum of money by way of compensation for the offence which may have been committed; and where any property has been seized as liable to confiscation, may release the same on payment of the value thereof as estimated by such officer.

On the payment of such sum of money, or such value, or both, as the case may be, to such officer, the accused person, if in custody, shall be discharged, the property seized shall be released, and no further proceedings shall be taken against such person or property.

Presumption that timber or forest produce belongs to Government.

56. When in any proceedings taken under this Act, or in consequence of anything done under this Act, a question arises as to whether any forest produce is the property of the Government, such produce shall be presumed to be the property of the Government until the contrary is proved.

CHAPTER VIII.

Cattle-trespass.

Cattle-trespass Act, 1871, to apply.

57. Cattle trespassing in a reserved forest or on lands on which the grazing of cattle has been prohibited by rules made under Section twenty-six, or which has been closed under Section twenty-seven, shall be deemed to be cattle doing damage to a public plantation within the meaning of the eleventh section of the Cattle-trespass Act, 1871, and may be seized and impounded as such by any Forest Officer or Police Officer.

Power to alter fines fixed by that Act.

58. The Governor in Council may, by Notification in the *Fort St. George Gazette*, direct that, in lieu of the fines fixed by the twelfth section of the Act last aforesaid, there shall be levied, in all or any of the areas to which this Act applies, for each head of cattle impounded under Section fifty-seven of this Act, such fines as he thinks fit, but not exceeding the following (that is to say) :—

	RS.	A.	P.
For each elephant	10	0	0
For each buffalo or camel	2	0	0
For each horse, mare, gelding, pony, colt, filly, mule, bull, bullock, cow, calf, or heifer	1	0	0
For each ass, pig, ram, ewe, sheep, lamb, goat or kid	0	8	0

CHAPTER IX.

Forest Officers.

Governor in Council may invest Forest Officers with certain powers.

59. The Governor in Council may invest any Forest Officer by name, or as holding an office, with the following powers (that is to say) :—

(*a*) the powers of a Settlement Officer under the Madras Boundaries Act, No. XXVIII of 1860 ;

(*b*) the powers of a Civil Court to compel the attendance of witnesses and the production of documents ;

(*c*) power to hold enquiries into forest offences, and in the course of such enquiries to receive and record evidence, and to issue search warrants which may be executed in the manner provided by the Code of Criminal Procedure.

(*d*) power to accept compensation for forest offences under Section fifty-five ; and may withdraw any powers so conferred.

Any evidence recorded under clause (*c*) of this section shall be admissible in any subsequent trial before a Magistrate of the alleged offender : Provided that it has been taken in the presence of the accused person, and recorded in the manner provided by Section 333, Section 334 or Section 335 of the Code of Criminal Procedure.

Forest Officers deemed public servants.

60. All Forest Officers shall be deemed to be public servants within the meaning of the Indian Penal Code.

Indemnity for acts done in good faith.

61. No suit or criminal prosecution shall lie against any public servant for anything done or omitted in good faith under this Act.

Forest Officers not to trade.

62. Except with the permission in writing of the Governor in Council, no Forest Officer shall, as principal or agent, trade in timber or forest produce, or be or become interested in any lease or mortgage of any forest, or in any contract for working any forest, whether in British or foreign territory.

CHAPTER X.

Miscellaneous.

Additional powers to make rules.

63. The Governor in Council may make rules consistent with this Act—

(*a*) to declare by what Forest Officer, or class of Forest Officers, the powers or duties conferred or imposed by or under this Act on a Forest Officer shall be exercised or performed ;

(*b*) to regulate the procedure of Forest Settlement Officers ;

(*c*) to regulate the rewards to be paid to officers and informers from the proceeds of fines and confiscations under this Act, or from the Public Treasury ;

(*d*) for the preservation, reproduction, and disposal of trees and timber belonging to Government, but grown on lands belonging to or in the occupation of private persons ; and

(*e*) generally to carry out the provisions of this Act.

Rules when to have force of law.

64. All rules made by the Governor in Council under this Act shall be published in the *Fort St. George Gazette* and in the official Gazettes of the districts affected thereby, and shall thereupon have the force of law. Such rules may be cancelled or varied by like Notification.

Powers of Government exercisable from time to time.

All powers conferred by this Act on the Government may be exercised from time to time as occasion requires.

65. It shall be lawful for the Governor in Council to delegate any of the powers conferred by Sections nineteen, twenty, twenty-two, twenty-seven, fifty-eight, and sixty-two to the Board of Revenue, or to such other controlling Revenue authority as the Government may from time to time appoint.

Governor in Council may delegate powers.

66. All money, other than fines, payable to the Government under this Act or any rule made thereunder, or on account of timber or forest produce, or of expenses incurred in the execution of this Act in respect of timber or forest produce, and all compensation awarded to Government under this Act may, if not paid when due, be recovered, under the law for the time being in force, as if it were an arrear of land revenue.

Recovery of money due to Government.

67. When any such money is payable for, or in respect of, any forest produce, the amount thereof shall be deemed to be a first charge on such produce; and if such amount be not paid when due, such produce may be taken possession of by or under the authority of the District Forest Officer, and may be retained until such amount has been paid, or such Forest Officer may sell such produce by public auction, and the proceeds of the sale shall be applied first in discharging such amount.

Lien on forest produce for such money.

Power to sell such produce.

The surplus (if any), if not claimed within two months from the date of the sale by the person entitled thereto, shall be forfeited to Government.

68. Whenever it appears to the Governor in Council that any land is required for any of the purposes of this Act, such land shall be deemed to be needed for a public purpose within the meaning of the Land Acquisition Act, 1870, Section four.

Land required under this Act to be deemed to be needed for a public purpose under the Land Acquisition Act.

APPENDIX V.

PAPERS ON KUMAKI LANDS IN SOUTH CANARA.

EXTRACT FROM THE PROCEEDINGS OF THE BOARD OF REVENUE, DATED 19TH JULY 1882, No. 1819.

Read the following:—

Letter from J. STURROCK, Esq., Acting Collector of South Canara, to the Secretary to the Board of Revenue, dated Mangalore, 29th April 1882, *No.* 982.

The principles laid down in G.O., dated 23rd October 1874, No. 1361, having been disapproved * by the Secretary of State, it has become necessary to take some special steps for the regulation of the supply of firewood to the town of Mangalore.

* G.O., dated 7th December 1881, No. 1884, Revenue Department.

2. As the Board—and especially the Second Member †—are well aware, there is hardly a stick of firewood within easy marketable distance of the town of Mangalore which does not owe its existence at the present day to the influence or outlay of some private individual, and, pending the discussion of the application to this district of the decision in the North Canara Forest case, which I hope to enter into when the forest enquiries have been completed and the Conservator has visited this district, it is necessary to adopt some *ad interim* measures by which the instructions of the Secretary of State may be attended to on the one hand, while on the other, care may be taken that private individuals are not unnecessarily deprived of the benefits of their care and watchfulness, while the interest of the Wargdar is enlisted on the side of conservancy, rather than on that of wholesale destruction under color of the enjoyment of communal rights.

† Paragraph 49 of letter, No. 827, recorded with Board's Proceedings, dated 21st March 1871, No. 1222.

3. The adoption of the proposals made in Mr. Thomas' letter, No. 827, recorded in Board's Proceedings, dated 21st March 1871, No. 1222, must, I think, be deferred pending the fuller discussion above alluded to; and as a temporary arrangement, I can think of nothing better than giving the preferential right of cutting firewood for sale, on the payment of seigniorage, to the Wargdar who would have the preferential right to the land if it were applied for on darkhast. The seigniorage prescribed in Board's Standing Order, No. 92, being small in comparison with the price of firewood in the town, this arrangement will protect the interests of a Wargdar in all jungle to which his exclusive enjoyment as against other villagers is locally recognized, such local recognition being usually accorded not merely to the 100 yards limits but to the nettikatt or crest of the hill overlooking the cultivated land.

4. The general promulgation of an order to this effect has had no satisfactory results. Honest and timid men are holding their hand, but others are carrying on an illicit trade under color of the exercise of kumaki and communal rights, and the sale of trees grown on warg land. I have therefore drawn up a set of rules for the regulation of the supply of firewood to the town of Mangalore, which I enclose for the Board's approval, and request sanction for the temporary

employment of eight peons on a monthly salary of Rs. 8 as watchers and collectors of seigniorage fees. Once I get the trade into hand, I do not think that nearly so many men will be required, but the measure will be quite experimental at first, and I will be glad if the Board will sanction the full number and leave me to reduce them as I can, submitting more definite recommendations with my budget for next year. I have suggested a somewhat high pay, as trustworthy men will be required, and I propose to give the posts to peons now on Rs. 6, whose desire to retain the advantages of their permanent service will afford a better guarantee than can easily be got with men temporarily employed. The new men engaged under the sanction now applied for will be put in to act for the peons.

5. I am aware that it will be almost impossible to apply the rules so as altogether to prevent the casual introduction of a load of firewood on which no seigniorage has been paid, but I am sanguine that the present wholesale evasion will be completely put a stop to. The rate of seigniorage is so low that it will not be worth while to run any great risk to avoid payment, and the traffic by boat, which is the most important, is capable of comparatively easy regulation.

6. Any funds that may be realized in this way I propose to spend on planting, and as there is now an unappropriated balance in hand of Rs. 672 besides an estimated sum of about Rs. 200 to be realized as seigniorage on account of recently-reported purchases of kumaki and nettikatt jungle by tile-manufacturers, I have the honor to request sanction for the expenditure of Rs. 500 during the current year in enclosing, planting and watering two small casuarina and honne plantations similar to those made by Mr. Thomas in 1868 and 1873, which are now in a very flourishing condition. I hope that the machine tile-manufacturers will plant for themselves on the terms sanctioned in Board's Proceedings, dated 22nd November 1881, No. 2918, but rumours of proposals to start manufactories at Goa and other places on the coast tend to deter the newer and smaller firms from entering on outlay which cannot produce an immediate return.

7. Sanction is also requested for the entertainment of a watcher for the Uruva garden or plantation, which has, since the practical abandonment of all Jungle Conservancy work after the issue of the order of 1874, been let out for cultivation to the great detriment of the trees put down by Mr. Thomas. I have now resumed charge of it.

8. The usual proposition statement is enclosed.

ENCLOSURE NO. 1.

Notification.

It having come to the notice of the Acting Collector that large quantities of firewood from kumaki lands and from village jungles are brought into the town of Mangalore for sale, the attention of all parties concerned is drawn to the illegality of the traffic, and it is hereby notified that such firewood is liable to be seized and confiscated wherever found, and those concerned in the cutting criminally prosecuted.

2. The rights of Wargdars over kumaki land extends only to leaves and wood for domestic and agricultural purposes, and it is not desired to encourage the denudation of such lands even on payment of seigniorage; but where a Wargdar shows that the growth of wood on his kumaki is in excess of that required for such purposes, he will be authorized by license to cut a certain amount of firewood for sale in the town of Mangalore, which will be subject to the payment of seigniorage at the prescribed rates of—

	RS.	A.	P.
Head-load	0	0	3
Bandy-load (one bullock)	0	3	0
Bandy-load (two bullocks)	0	6	0
Boat-load of one korjee	0	12	0

3. Government recognize no private rights over jungle land lying between kumaki and nettikatt limits, but in the event of it being decided, on application or otherwise, to allow the felling of jungle on any such land for sale as firewood in the town of Mangalore, a preferential claim to obtain a license to cut it, subject to the payment of seigniorage, will be given to the same Wargdar as would have the preferential right to obtain the land on darkhast. Where no such preferential claim is made out, the right of clearing the jungle within a given time will be sold to the highest bidder.

4. All firewood cut under the above rules must be brought into Mangalore by one or other of the following routes, and seigniorage paid to the officer appointed to collect it at the station for each route:—

Route.	Station.
Bantvál River	Jeppu or Bunder.
Gurpur River	Bunder.
Sea	Bunder.
Bantvál Road	Kankanady Toll-gate.
Kadri Road	Kadri Toll-gate.
Bajpe Road	Junction of Bijai Road.
Kullur Road	Uruva Garden.

5. On arrival at any station the carrier of the firewood must produce a way-permit from the licensee, and on payment of the seigniorage due, a receipt will be given which will serve as a pass for the conveyance of the firewood through the town. Counterparts of the receipts thus issued will be despatched daily to the Taluk Cutcherry with the collections and way-permits, and when the full amount authorized to be removed from any jungle appears to have been brought into the town, or when the period of the license has expired, the jungle in question will be removed from the station lists, and a report called for from the Potail of the village as to whether there is any reason to suspect that any illicit felling has taken place under cover of the license in question.

6. Nothing in the above rules is to be taken as authorizing the felling of any of the following trees:—

1. Teak.	8. Poon.	15. Kalboghi.
2. Blackwood.	9. Kalpone.	16. Bolandur.
3. Ebony.	10. Maruva.	17. Belitirpu.
4. Sandalwood.	11. Banapu.	18. Myrole.
5. Jack.	12. Tiruva.	19. Benga.
6. Wildjack.	13. Wate-hule.	20. Catechu.
7. Kiralboghi.	14. Kalbow.	21. Pulibaghi.

7. The above rules do not apply to firewood, *bonâ fide* produce of warg lands; but to avoid detention and delay, Wargdars are recommended to make use of warg way-permits, which will be supplied on application. Similar permits will be issued to Wargdars residing in the town of Mangalore who may desire to bring in firewood from their kumaki lands for their own use in the town. Firewood from licensed Kumeris in the Kásaragód Taluk will be considered warg produce within the meaning of this rule.

ENCLOSURE No. 2.—Proposition Statement.

RESOLUTION.—The long discussion on supposed communal rights to firewood having consummated the anticipated destruction of all firewood in Government lands within a marketable distance of the ports, the extravagant price of this necessary of life has become a great evil and the only firewood now in existence is in the kumaki lands. Availing themselves of the position, the Kumakidars send large quantities of firewood to market, and have thus become *quasi*-timber merchants as well as cultivators.

2. It was not for this purpose, but for farm and domestic use, that the kumakis were given them; this principle has always been maintained in connection with the timber trees growing in kumakis, which could not be felled except on payment of seigniorage. The Collector proposes to apply the same principle to the fuel trees not used for the agricultural purposes for which they were given, but sent to market, and to utilize the proceeds of such seigniorage for Village Jungle Conservancy purposes.

3. This is put forward as an *ad interim* policy till such time as the wider proposals made in the then Collector, Mr. Thomas' (now Second Member's) letter, No. 827, recorded in Board's Proceedings, dated 21st March 1871, No. 1222, are discussed; and it is argued that the lightness of the seigniorage to be charged will insure its being inoperative to discourage the Kumakidar from giving to the growth of firewood in his kumaki the same careful protection as heretofore.

4. With these propositions the Board concur. But, when the Collector goes a step further and proposes to interfere with the Kumakidar to prevent his felling too much, they believe that such intervention, though well meant, would prove mischievous, in that it would tend to shake the belief that it was left to the cultivator to consult his own interests unfettered, and might even degenerate in the hands of subordinates to leading to the belief that he was desired to fell in order that Government might derive seigniorage. The Board would prefer that there should be no more interference with the Kumakidar's felling than heretofore, but that he should be given to understand that fuel cut for sale would be liable to confiscation on its way to market unless covered by a pass, and that to secure such fuel he had only to apply to the head of his own village for a pass. On these passes the seigniorage could be levied as proposed.

5. Before submitting for the approval of Government this modification of the Collector's proposal, the Board would wish to be assured that in the Collector's opinion it would be as practical to work as his own plan.

6. While willing to support this *ad interim* policy, however, the Board would wish to impress upon the Collector that he should watch very carefully that the levy of seigniorage and the demand for passes does not in any unexpected way lead to a loss of personal interest in, and consequent denudation of, kumakis by their holder; and they further wish to place on record that it is only as an *ad interim* policy that they support it,—preferring as a permanency the wider proposals above alluded to.

EXTRACT FROM THE PROCEEDINGS OF THE BOARD OF REVENUE, DATED 19TH AUGUST 1882, No. 2078.

Read the following :—

Memorandum by D. BRANDIS, Inspector-General of Forests, dated 10th August 1882.

The Proceedings of the Board of Revenue of the 19th July last, No. 1819, seem to raise the question whether the status of *kumaki* lands in South Canara is provided for in the Forest Bill now before the Legislative Council.

2. The question is whether these *kumaki* lands fall within the definition of "Land at the disposal of Government" (Section 2), to which Chapter III of the Bill applies, or whether they should not rather be regarded as lands in which Government has only a limited interest.

In the latter case the provisions of Section 42 should apply.

As a matter of course it is not practicable at present to decide authoritatively which provisions of the Act should be held to apply to *kumaki* lands. These are questions of fact which, on a case arising, must be decided in a Court of Law.

Nevertheless it is necessary to consider the question before the Act is passed, in order to determine whether any additional provision requires to be inserted in the Bill to facilitate the application of the Act to *kumaki* lands.

3. The Collector's letter of 29th April, as well as the draft rules submitted by him, are apparently based on the assumption that *kumaki* lands are not the property of the Wargdar, and do not fall under the category of occupied lands. The Collector maintains that the rights of the Wargdar in *kumaki* lands extend only to leaves and wood for domestic and agricultural purposes; and he considers that Government has the power to authorize by license the cutting of firewood for sale or to withhold such license. He proposes that such licenses should only be granted when a Wargdar shows that the growth of wood on his *kumaki* lands is in excess of what he requires for domestic and agricultural purposes, and that the license shall be limited to a certain quantity of wood to be cut, as well as to a certain period. The license is intended to terminate when the full amount authorized to be removed has been brought into the town, or when the period of the license has expired.

4. The Collector makes his proposals applicable also to jungle land lying between *kumaki* and *nettikattu* limits; but in regard to these lands he distinctly states that Government recognize no private rights, and that if it is desirable to allow cutting of firewood on such land, the adjoining Wargdar, who has the preferential right * to obtain the land on darkhast, shall have a preferential claim to obtain a license to cut the wood on such land. The Collector adds, that when no such preferential claim is made out, the right of clearing the jungle within a given time will be sold to the highest bidder.

* This is the expression used in Rule 3 by the Collector. If strictly accurate, it would imply the existence of Mirassi rights in South Canara.

These lands clearly come under the provisions of Chapter III. They are not the property of the Wargdar, nor are they in his occupancy. The only privilege which the adjoining Wargdar has with regard to these lands consists in a "preferential right" to obtain the land on darkhast, as stated in Rule 3, and in the "local recognition of his exclusive enjoyment as against other villagers" as explained in paragraph 3 of the Collector's letter.

Evidently, therefore, the Collector considers that the Wargdar has a certain interest in the lands outside his *kumaki*, and this interest apparently consists in his exclusive enjoyment, as against other villagers, of certain produce of such land. This interest, although locally recognized, is not, however, recognized by Government as clearly stated in Rule 3.

5. So far the application of the Forest Bill to these lands seems to present no difficulty. *Kumaki* lands are unoccupied and at the disposal of Government, but they are burdened by easements or rights of user possessed by the Wargdars. In the language of the "Easements Act," the *warg* land is the dominant heritage and the Wargdar is the dominant owner. The *kumaki* land is the servient heritage, and the right of the dominant owner consists in this, that he may take leaves and wood for domestic and agricultural purposes. Beyond this his rights do not go, and he is not permitted to do any act which would cause the deterioration of the servient heritage. The land between *kumaki* and *nettikattu* limits is clearly the property of the State, and apparently not burdened by any rights of user which the Wargdar can enforce against Government.

6. All this seems clear, but there are expressions in the Proceedings of the Board of Revenue which seem to show that the Board do not entertain the same views regarding the status of the *kumaki* lands as are held by the Collector.

The Board of Revenue indeed recognize the right of Government to levy seigniorage on both fuel and timber brought for sale from *kumaki* lands, and they add that the Kumakidar has always had to pay seigniorage for timber exported for sale, the only new proposal being to extend the principle to firewood. But the Board object to any interference with cuttings made by the Kumakidar. They merely wish him to take out a pass for the wood exported for sale, but do not deem it desirable that the fellings should require the previous permission of the Collector, and that the Collector should have the power to withhold such permission.

The reason given is that such interference would diminish the personal interest of the holder in the land given to him for farm and domestic use, and would in this way lead to the denudation of the *kumaki* lands.

7. According to this view of this case, it is possible that the Kumakidar might consider himself as possessed of the right to cut the wood growing on the *kumaki* land for sale, provided he paid the prescribed seigniorage in order to obtain a pass which would secure him against detention in transit; and however much the private interest of the Kumakidar might induce him to work his *kumaki* lands with due regard to the interests of his family, still there would be nothing in the arrangements to show that Government insists on its right as the owner of the servient heritage to guard against its deterioration.

In the absence of such a provision, it seems possible that the rights of the Kumakidar may gradually come to be regarded as more extensive than they really are.

If the Wargdar had continued for a considerable period to sell the produce of his *kumaki* lands without obtaining special permission, he might in time come to be regarded as the proprietor of the land, his proprietary rights being only subject to the payment of certain fees for the issue of passes.

8. I do not desire to enter into the question whether the Kumakidar's interest is likely to be sufficient to induce him to husband the growing stock on his *kumaki* land. When this question is taken up, I would suggest an inquiry as to whether the Wargdars are in the habit of protecting their *kumaki* lands against fire. This is the first step which, in forests like those of South Canara, must be taken in the way of protection. If they are sufficiently careful to protect their *kumaki* lands against the jungle fires of the dry season, they may reasonably be expected to be provident enough to maintain those jungles in a satisfactory and productive condition. Habits of improvidence, however, are very common, and the temptation to realize a sum of money immediately may often prove stronger than the regard for the future welfare of the estate.

9. Very likely the best plan may be, for other reasons, to assign the *kumaki* lands to the Wargdar on the same tenure as the lands included in his warg, clearly to demarcate these *kumaki* lands, and to levy assessment upon them.

This is not the question which I desire to submit for consideration on the present occasion. What should, in my opinion, be considered is, whether the Forest Bill now before the Council sufficiently provides for the case of the *kumaki* lands, or whether any additional provisions require to be inserted.

RESOLUTION.—Dr. Brandis asks whether the Forest Bill now before the Council sufficiently provides for the case of *kumaki* lands in Canara, or whether any additional provisions require to be inserted.

2. The Bill enables Government to take action in regard to—

(*a*) land at the disposal of Government, and
(*b*) land in which Government has only a limited interest.

3. "Land at the disposal of Government" is defined as including all unoccupied land, whether assessed or unassessed; but does not include land the property of landholders as defined by Section 1, Act VIII of 1865, Madras.

4. Land falling under Class (*a*) can be dealt with summarily under Chapter III; while for lands under Class (*b*) a more elaborate procedure is laid down in Chapter IV. But in either case power is taken in the Bill to enable Government to preserve the forest standing on such lands, and whatever view may be held of the rights of a Wargdar over his *kumaki*, it is clear that the provisions of the Bill as drafted are ample to enable the officers of Government to intervene for the purpose of forest conservancy.

5. The answer therefore to the question raised by Dr. Brandis is, that there is no occasion to add to the Bill any special provision to meet the case of *kumaki* land in Canara; on the contrary, it seems to the Board most undesirable to introduce into a legislative enactment of this kind any special clause giving prominence to the subject.

6. As regards the rights of Wargdars over *kumaki* or auxiliary lands, Dr. Brandis is referred to the report of Mr. T. L. Blane, Collector of Canara, in 1848, where he says that these lands "do not appear to have originally differed materially from the waste lands used for similar purposes in other parts of the country, except that, in place of being common to the whole village, they were divided and enjoyed in separate portions by the individual landholders. The original terms upon which they were held then I conceive to have been essentially as an adjunct to, and in connection with, the cultivated lands, and the right to them to have been a modified right, and only to be enjoyed for the purposes for which they were held as above stated." This passage is quoted at page 94 of the Judgment of the High Court of Bombay in Regular Appeal * No. 49 of 1872, delivered by the Honorable Raymond West, in which the whole subject of forest rights in Canara is exhaustively treated.

* G.O., 2nd March 1880, No. 273.

7. The Board would also refer the Inspector-General of Forests to G.O., 20th May 1865, No. 1065, wherein Government declared that all existing kumaki rights must be respected, and to G.O., dated 2nd August 1865, whereby the Collector is authorized to refuse the exclusive right of kumaki in the case of land newly granted on darkhast.

8. But while insisting upon the limited right which the Wargdar possesses over his kumaki land, and holding that the Forest Bill makes ample provision for the exercise of control by the officers of Government, the Board are decidedly of opinion that the holders of kumaki have done so much for the conservation of jungle in the district that any interference on the part of the State under the Forest Act will very rarely be called for and should generally be discouraged.

EXTRACT FROM THE PROCEEDINGS OF THE GOVERNMENT OF MADRAS, LEGISLATIVE DEPARTMENT, DATED 13TH DECEMBER 1882, No. 78.

Read the following :—

Letter from J. STURROCK, Esq., Acting Collector of South Canara, to the Chief Secretary to Government, dated Mangalore, 31st August 1882.

In submitting a few remarks with reference to Mr. Brandis' memorandum on the application of the Forest Bill to kumaki, I wish to state at the outset that my proposals dealt with in Board's Proceedings, dated 19th July last, No. 1819, are merely an attempt to carry out the instructions of the Secretary of State that I must deal with forest matters on the principles accepted before the issue of G.O., dated 23rd October 1874, No. 1361. I have no definite information as to the reasons which induced the Secretary of State to arrive at this decision, but I suppose there is no doubt that it was based on the result of the North Canara Forest case. The decision of Mr. Justice West in that case contains a very careful and almost exhaustive examination of the forest administration of Canara after the British came to the country, which proceeded on the same lines both in North and South Canara, and though I must not attempt in a note of this kind to enter into any elaborate discussion of the applicability of all his remarks to South Canara, I desire very briefly to draw attention to the very different footing on which the forests of North and South Canara stood at the commencement of British rule.

G.O., dated 7th December 1881, No. 1884.

2. As pointed out at page 18 of the decision in the North Canara Land Assessment case,* only a small portion of the present North Canara District formed part of ancient Canara. The bulk of it was formerly known as Soonda, with regard to which Sir Thomas Munro wrote in 1800 : " Gardens or plantations of cocoanut, betel and pepper are considered as private property and follow the same rule as in Canara, but all other land is supposed to belong to the Sirkar." In the same letter he writes very differently regarding land in Canara Proper, and when his remarks are read in conjunction with his minute on the Timber Monopoly, dated 26th November 1822,† it is, I think, very clear that, rightly or wrongly, he was of opinion that a very large portion of the forests in Canara were regarded as the private property of the Wargdars long before the British came to the country.

* Vya Kunta Bapaji *versus* Government of Bombay. Appendix to Volume XII of Reports of Cases decided in the High Court of Bombay.

Paragraph 31 of Sir Thomas Munro's letter, dated 31st May 1800; p. 74 of Sir A. J. Arbuthnot's edition of Sir Thomas Munro's minutes and letters.

† P. 178 of Sir A. J. Arbuthnot's edition of Sir Thomas Munro's minutes.

3. From Mr. Justice West's decision in the North Canara Forest case it appears that in the early years of the British administration it was the practice not only to admit generally throughout North as well as South Canara the private rights over forest land believed to have been found in Canara Proper, but even to alienate the unclaimed wastes which Sir Thomas Munro considered to be Government property;‡ and when a different policy began to prevail, the distinction drawn by Sir Thomas Munro between Canara and Soonda was similarly lost sight of, and an assertion of Government rights natural to North Canara was extended to South Canara also.

‡ Indian Law Reports, Bombay Series, Volume III, 1879, pp. 552, 557, and many other parts of Mr. Justice West's Judgment.

4. In the particular case decided in the Bombay High Court, the plaintiff's claim to hold sanads from former Native Governments was obviously false. Any title they had ever had was only acquired under British administration, and in deciding that the suit was barred by limitation Mr. Justice West remarked § : " But having allowed that Martoba and Bhaskarappa had, through the knowledge and quiescence of the local authorities, acquired an actual possession of lands subjected to Kumeri cultivation down to the year 1842, we must not refuse efficacy to the acts of the same authorities if they afterwards, depriving Bhaskarappa, assumed or resumed possession on behalf of the Government." In North Canara, therefore, or the greater part of it at any rate, equity and law seem to have run hand in hand in forest administration. In South Canara it is by no means clear that this is the case, unless Sir Thomas Munro was wrong (which possibly he may have been); but however that may be, the applicability of the law of limitation is not affected, and I think it may safely be assumed that the Government now possess over the great bulk of the forests in South Canara extensive rights

§ P. 782, Indian Law Reports, Bombay Series, Volume III, 1879.

which cannot be challenged in a Court of Law. The question of how far it is desirable, on conservancy or other considerations, to enforce these rights against the Wargdars is one which need not be gone into here.

5. The particular classes of forest or jungle referred to in Mr. Brandis' memorandum are nettikatt and kumaki. Originally the kumaki or exclusive rights over forest land as an aid to cultivation extended up to the "nettikatt" or crest of the hill overlooking a cultivated valley, but for many years it has been limited to 100 yards from cultivated land. The idea that this was done by Mr. Harris in 1823 has, I think, been completely exploded, but however the limitation may have risen there is no doubt that it is one of long standing. The strongest assertion of the limitation that I know of is to be found in the papers recorded with G.O., dated 20th May 1865, Revenue Department, No. 1065, sanctioning the draft Forest Rules of 1864. In the Board's Proceedings, dated 15th February 1864, No. 986, with which the Government quite agree, the claim to the exercise of *exclusive* right is limited to the extent of 100 yards, but the Board remark that the restriction does not preclude cultivators from collecting leaves, &c., for manure in the Government jungle beyond the limits of the kumaki, and in paragraphs 3 and 4 of a later Proceedings, dated 30th January 1865, No. 490, the Board remark: "Thus it appears that according to the acknowledged and long-established custom of the district, individual ryots may at pleasure fell trees other than the prohibited kinds within the distance of 100 yards from the cultivated lands, though not in their wargs, and sell such trees within their village, and also that beyond this distance the cultivators of each valley have the common usufruct of the open hill sides up to the water-shed dividing each valley, but must not cut down trees growing in this common land.

"The Board are not disposed to sanction any additional restrictions on these privileges."

Vide Board's Proceedings, dated 21st March 1871, No. 1222, paragraphs 17, 22, and pp. 731, 733, North Canara Forest case, with regard to which it is to be noted that the Tahsildar referred to belonged to Soonda.

6. So far as I know this is the strongest assertion of Government rights over land between kumaki and nettikatt limits made by any responsible authority; and in stating in my letter recorded with Board's Proceedings, dated 19th July last, that Government recognized no private rights over the land, I used the word "private" as opposed to "communal." The communal right to the usufruct of such land has always been recognized, and the Board's remark that Wargdars must not cut down trees growing on the common land has always been understood to refer to trees of the prohibited kinds. That this was really their meaning is clear from the wording of the proclamation quoted by the Board in the paragraph preceding those I have transcribed above. The right to cut unreserved timber is specifically allowed in Rule 10 of the Forest Rules of 1864 to those who have not sufficient timber for their requirements on kumaki land.

7. From the above it will be understood that though I agree with Mr. Brandis that land between kumaki and nettikatt limits falls under Chapter III of the Forest Bill, I am not prepared to say that it is not burdened by any rights of user which can be enforced against Government.

8. The substitution of communal for individual rights has had a most disastrous effect upon forest conservancy. Fortunately the individual rights never ceased to be locally recognized in many localities, and there has been a general reassertion of individual rights since the issue of G.O., dated 23rd October 1874, No. 1361. In the neighbourhood of the town of Mangalore it may be broadly stated that, as a rule, no forest or jungle exists outside kumaki limits, except where such individual rights have been respected. I say, as a rule, because there are instances in which Wargdars have jointly arranged for the conservancy of the jungle. Whatever may have been the origin of such arrangements, they seem to be of very old standing, and in some villages near the coast there is a general unwillingness to acknowledge individual rights even within the 100 yards limit.

9. As regards kumaki lands, I am sorry that any one should have supposed from a letter of mine that there was any doubt that they are in the occupancy of the Wargdar, and thus fall within Chapter IV of the Forest Bill. The Wargdar's house and farm buildings and those of his tenants are usually on his kumaki land, which is completely under his control, subject to the restriction that it is liable to be assessed if he cultivates it with other than "hukle" cultivation,* that he must not fell any of six reserved kinds of timber,† or sell any of the natural produce outside his own village except on payment of seigniorage.

* G.O., 27th Sept. 1867, No. 2268, Financial, No. 14.
† Rule 7, Forest Rules of 1864.
Board's Proceedings, 11th October 1873, No. 2081, and papers referred to therein.

10. In my draft new rules I proposed to regulate the trade of firewood on principles which had been promulgated prior to 1874, but I had no intention of introducing any new restriction.

11. In Rule 7 of the Forest Rules of 1864, ryots are alluded to as being "in possession" of kumaki land, and in paragraph 11 of their Proceedings, dated 17th November 1860, No. 5359, the Board of Revenue, while strongly asserting the liability of a Wargdar to be dealt with under the criminal law for felling reserved timber, remark that it was not disputed "that the defendant was in occupation of the land."

APPENDIX VI.

INFLUENCE OF FORESTS ON SUB-SOIL MOISTURE. By D. E. HUTCHINS, Assistant Conservator of Forests, Mysore, dated Ootacamund, the 9th October 1882.

IN temperate climates, one of the observed effects of the removal of forests, and the ensuing desiccation of the country, is the diminution or stoppage of springs. But in hot, dry climates this convenient index of the quantity of moisture below the soil fails us. During five or six months of the year the upper layer of soil may be completely dry, and hence any springs which the formation of the country may throw towards the surface of the ground are absorbed before they can reach it. This layer of very dry soil does not extend more than a few feet in depth. On digging a series of pits three feet deep in such soil, the earth at the bottom shows here and there, by smell and touch, some signs of sub-soil moisture. We see also evergreen trees around us, and conclude that at greater depths there is sufficient moisture for roots to perform their functions. Here and there will be found wells from twenty to a hundred feet deep. The bottom of these wells reaches water-level, from which point to the surface the sub-soil moisture decreases nearly regularly. As water is taken from the well a fresh supply slowly percolates in from above, replacing that which has been removed.

This absence of moisture at the surface of the earth during the dry season is the agriculturist's winter. Cereal vegetation sleeps, and the seed awaits the first showers of rain to germinate. But with trees the period of repose is absent, or short, and the length of this period of repose—the time during which a tree is leafless—depends, in a hot, dry climate, primarily upon the amount of sub-soil moisture which can be reached by the roots.

A forest in the dry climates outside the immediate tropics presents complex phenomena. What first forces itself upon our notice is, that the influence of trees on sub-soil moisture is two-fold and conflicting—

First.—Influences tending to increase sub-soil moisture, such as the well-established effect of forests in arresting the onflow of surface moisture; the effect of forests in shielding streams and damp soil from surface evaporation; the direct influence of forests on rainfall; on mountains, the condensation of drifting cloud, sometimes called "drip."

Second.—An influence of an opposite tendency, namely, the draining action of trees on sub-soil moisture.

In temperate climates the first set of influences usually far outweigh the second, and where the second is the most powerful, sub-soil drainage is usually an unmixed benefit. But in dry climates, where the facility of establishing trees and wells depends on an abundant sub-soil moisture, the powerful sub-soil drainage carried on by trees demands careful consideration, and a separate study of the influences at work in each locality. I propose to offer a few observations on cases which I have observed, illustrating both the draining action of trees and their protective influence.

2. There are thirteen plantations situated to the north-east of Bangalore, composed chiefly of Casuarina, and varying in size from 160 to 1,200 acres. The soil throughout is a nearly level, deep, red loam. The Casuarina is here an evergreen. It is naturally a lover of moisture. Placed on these dry upland loams, it shows by far the best growth of any tree that has yet been tried, and it is hardy, withstanding drought better than the Casuarina grown in the forcing climate of the Madras sea-coast. It obtains the moisture it requires by a root-growth extending rapidly deep into the loams on which the tree is found to flourish best. The young trees are planted out in large pits, a yard cube, which are expensive, but which are found to be absolutely necessary for planting on a large scale where watering is impracticable. And there is no reasonable doubt that the utility of these large pits lies in the fact that they stimulate a rapid and deep root-growth, enabling the young trees to tap at once a level of sub-soil moisture, where the roots can perform their functions during the trying period of a first hot weather. In the case of a tree with the vigorous and rapid growth of Casuarina, bathed in a dry and rarified air, the watery exhalations from the stomata (which cover everywhere the green surfaces of trees) must be very great. We should accordingly look for an exhaustion or a lowered level of sub-soil moisture near a mass of Casuarina; and this, I think, is the case. When the Casuarina plantations were first opened, the nurseries were naturally made close to the first planting or at some central point in the plantation site. Wells were dug, and supplied the nurseries for some years. But gradually, as the Casuarina reared its graceful foliage around the wells, the supply of water began to fail. One after another the wells within the Casuarina plantations have gone dry. They have been deepened year by year, but the deepening has failed to keep pace with the lowering of the level of the sub-soil moisture. The wells have had to be abandoned, and the nurseries are now located at a distance of from a quarter to half a mile from the plantations. Among the items of planting expenditure, there is now a regularly-established rate for "carriage of plants from nurseries beyond one mile," distances within a mile being included in the ordinary rates.

3. Again, in the cantonment of Bangalore, so many trees have been planted that, from the nearly treeless plain outside, the station has the appearance of a forest. These trees are Casua-

rinas or other evergreen species planted for shade, and therefore tend to exhaust the sub-soil moisture throughout the year. I can recall three occasions within the last few years, when leading articles or comments have appeared in the local papers, lamenting the gradual but steady fall of water in the wells at Bangalore, this fall being attributed to the planting of unsuitable trees with deep roots; and it was suggested that the planting of trees proved to have this effect should be prohibited within municipal limits. The fact of the matter is, that a rapid growing evergreen tree is a physical impossibility in that climate, unless the tree can obtain a steady supply of water from sub-soil moisture; and the more wells and the more evergreen trees we establish, the lower falls the sub-soil moisture.

4. So far regarding the draining action of trees. In regard to their influence in preserving moisture, the following instances observed by me may be of interest.

In the Savandrug forest—a large forest, valuable from its position thirty miles from Bangalore, with a rainfall of about thirty inches—which has been recently demarcated and settled, a curious effect is observable, illustrating the uneven distribution of sub-soil moisture and the power of forest growth to retain it. The ground is very hilly. The gneiss is there porphyritic and the hills take often the form of huge rounded monoliths, from which the rain rushes off as from the roof of a house. The narrow valleys between these hills receive a supply of rain-water equal to that of the rain which falls on their surface added to the rain-water rushing off the hills. The spongy forest soil retains this double supply of rain-water, and the forest vegetation exhibits characteristics similar to those found under a rainfall of fifty or sixty inches. In the valleys skirting the hills are to be noticed teak and the large bamboo, both of which belong to a country with a rainfall of from fifty to sixty inches. In Eastern Mysore the big bamboo only occurs on irrigated land and in the natural forest clothing the tops of a few hills high enough to have their summits above, and in the monsoon cloud level.

5. It is a rule that the finest forest growth in every country is usually that where the country becomes hilly or mountainous. This rule is probably truest for the drier portions of the earth, where sub-soil moisture becomes the necessity of a tree's existence in the dry season. A hilly country breaks up and distributes the sub-soil moisture, which in the valleys is usually close to the surface. But it often happens that the finest forest is that crowning the summits of the hills, the forest there drawing its supply of moisture direct from the clouds.

The upper portion of the Nundidrug hill, with an average elevation of 4,500 feet, and 1500 feet above the Mysore plateau, pierces the monsoon cloud level. The top of the hill is bathed in mist all night and early morning during eight or nine months of the year, and these mists last all day during bursts of the monsoon. Nundidrug hill-top is fairly wooded; it contains two evergreen sholas, together with scattered trees, most of which have been planted. These trees and woods arrest and condense the driving mist in a more striking manner than I have observed elsewhere. Pools of water feeding small rivulets may sometimes be observed under trees on exposed points. The moisture so obtained on Nundidrug is probably considerably greater than that from the rainfall. I have complete observations for one year from two registering rain-gauges: one placed on the top of the Nundidrug hill, the other in a sandal plantation at the base. Within a small fraction of an inch the readings were the same. The mean annual rainfall on Nundidrug is thirty-five inches; but the vegetation on the hill shows the presence of a more abundant moisture than could be produced by the rainfall alone. There are plants and trees such as *Michelia Champaca*, which in Mysore require an annual rainfall of fifty inches to flourish. There are two small sholas, springs, wells, and a fine tank of water on the hill, all of which are evidence of an abundant sub-soil moisture. Nundidrug is a huge monolith of gneiss, with a thin capping of red loam and permeable felspathic schists, conditions not favorable for the retention of moisture on the hill. Near Nundidrug there are hills of the same altitude and with a similar soil, but with few trees and without springs. One hill has a small wood of *Shorea Talura*, but there is no shola forest. It is necessary to look to the drip from the trees to account for the presence of so much moisture on the Nundidrug hill; and this moisture the two small sholas conserve, in spite of a geological formation which allows water to run off rapidly both above and below the surface soil.

APPENDIX VII.

MANAGEMENT OF FOREST REVENUE; being a joint Memorandum by A. W. B. HIGGENS, M.C.S., and C. G. DOUGLAS, Deputy Conservators of Forests.

UNDER existing circumstances, all forest revenue in the Madras Presidency passes into the accounts under one of the two main heads I, Forests; II, Jungle Conservancy. Of these, the former is under the control of a special department, while the latter has, up to date, been under the control of the Revenue Officers of the districts.

We will speak of each of these main divisions separately.

2. Forest revenue may be arranged under the following heads :-

I. That which is derived from timber and other produce removed from the forests by Government agency.
II. That from timber and other produce removed from the forests by the consumers or purchasers themselves.
III. That from confiscated drift or waif wood.

3. *I. Revenue derived from timber, &c., removed from the forests by Government agency.*—This class represents the proceeds of departmental operations, so called in contradistinction to what is known as the "License and Voucher System," and to it belong the revenues of the most valuable forests in the Presidency, where the agency of Forest Officers is employed in felling, removing, and storing timber and other material for sale to the public, to railways, and more particularly to the Marine, Ordnance, and Public Works Departments. Such are the forests of the Anaimalais and other parts of Coimbatore, Wynaad, Mudumalai, Nilambúr, the sandalwood tracts of Sígúr, Coimbatore, Salem, North and South Arcot, and the red sanders forests of Cuddapah and North Arcot, also the departmentally worked timber tracts of Salem, Madura, Tinnevelly, Pálghât, South Arcot, South Canara and Bellary. The railway fuel reserves in Pálghât, Coimbatore, Salem, North Arcot, Cuddapah, South Arcot, Madura, Trichinopoly and Tinnevelly, as well as the open forests whence railway fuel is drawn, are all worked departmentally, though the services of contractors are employed in various forms to carry out operations.

In South Canara a promising revenue is derived from firewood consumed in sandalwood oil stills. Portions of forest are set apart for the purpose, and the distillers occupy an area in proportion to the number of stills they work, and pay so much per still for the right to cut and burn Government wood. There are, of course, conditions providing against damage and waste.

4. Minor products, such as cardamoms, ginger, honey, wax, resins and dyes are collected through the agency of the hill tribes wherever such exist (agreeably to the Government order of July 1880), but the departmental system, as applied to these, is yet in its infancy, and has only made real progress in the South Coimbatore forests (Anaimalais). There the hill-men bring their produce to certain specified depôts held by approved merchants, who buy at rates previously fixed. The merchants pay a percentage on the transaction to Government, and before removal of their purchases must show a treasury receipt for the amount due. The Anaimalais offer certain facilities for this system. They are uninhabited except by hill tribes, and the department can exclude all others; the business is thus conducted under strict supervision. In other districts where this plan has not been introduced, the right to collect minor produce is leased out to contractors, as in Salem, Madura, Tinnevelly, the agency employed being that of hill tribes, and the collections being always carried out with due regard to the rights of these people as recognized by Government.

5. Revenue is obtained from tamarinds, the produce of trees in the Government forests of Salem and South Arcot; but these do not concern the hill tribes. The crop is generally sold by tender.

6. Money for timber and other produce is not received by Forest Officers; it is paid into a treasury, and the purchaser is not allowed to remove the property from the depôt till he produces a receipt for the money. In the case of Government departments, the adjustment of sales is merely a book transaction.

7. In the case of engine fuel purchased by railway companies, the practice is for the company to pay Government a royalty, the amount of which is deducted from the sum agreed on with the contractor, for the fuel supplied from Government reserves or open forests; the balance is then paid to the contractor, and covers working expenses and a margin for profit. Thus, suppose Rs. 6 to be the price agreed upon with the railway company for a ton of firewood supplied from the forests by a contractor, and Rs. 2 the Government royalty; this Rs. 2 is paid by the railway company to the Forest Department, and the balance Rs. 4 given to the contractor.

8. *II. Revenue from timber, &c., removed by consumers and purchasers.*—This class of revenue represents the results of the "License and Voucher System," a system which, with the exceptions of Malabar and Trichinopoly, is to be found in some shape or form in every forest district of the Presidency.

9. In some districts, and especially in Salem, North Arcot and Pálghât, the seigniorage collections have been farmed out to contractors under stringent regulations, the department receiving a fixed sum per annum for one or more years, and the contractor being bound to conduct his operations in all respects like the department. This has answered well.

10. The rates of seigniorage levied and the rules under which felling and removal are permitted vary in every district. All, however, have the rules of 1863 as a basis, and local considerations have determined the modifications which from time to time have been introduced.

Under this system, persons requiring timber, bamboos, firewood or charcoal, and, in some cases, grass from fuel reserves, pay to a Revenue Officer the prescribed seigniorage and are furnished with a voucher. The voucher is then taken to the Forest Officer, who, if he sees fit, issues a license allowing the bearer to cut and remove, from a specified locality, within a given time, and by a certain route, the quantity of timber or other produce for which he has paid seigniorage. These licenses are issued subject to the conditions of the local and general rules for conservancy, the infringement of which renders the offender liable to forfeiture of his license, and, in some cases, to prosecution under the Penal Code. On removal of the produce, or on the expiry of the allowed period, the license is checked and endorsed and eventually recovered by tannah peons or village officers. In some districts or parts of districts Revenue Officers grant both licenses and vouchers. In some districts a commission is paid to village officers on the amount of revenue collected by them, and for the supply of towns in Madura, a system of selling tickets for firewood and unreserved timber through gomastahs, who are paid by a commission on their sales, is working well. This system is shortly to be introduced in Cuddapah. Tickets for firewood and unreserved timber are also granted by Tahsildars and village officers in Cuddapah, South Arcot, Coimbatore and elsewhere, enabling the holder to cut and remove the quantity for which he has paid seigniorage.

11. In fixing the rates of seigniorage charged on timber, a distinction has been made in all districts between reserved and unreserved trees, and between timber removed by purchasers in the rough and that which has been worked up in the forest by adze or saw. Similarly a higher charge is made for bamboos split than when removed "plain" or whole; and the tax on charcoal removed from the forest is proportionate to the consumption of fuel in the process of its manufacture.

12. Generally speaking the seigniorage levied on unreserved timber in the rough is one rupee per cart-load of 750 to 1,000 lbs., and for the same class "worked up" the average is two rupees. In Ganjam it is only one rupee four annas, and in Trichinopoly four rupees.

In most districts the unreserved kinds of timber may be removed in small quantities, such as bullock, ass, or head loads, at proportionately reduced rates.

13. The reserved kinds are numerous, and, of course, vary in different districts according to local circumstances. Some, such as sandal, red sanders, tamarind, mango and wood-apple, may not be cut at all, except under special permission; others, such as *Terminalia Arjuna*, *Bassia latifolia*, *Diospyros Ebenum*, satinwood, yépi and yégi, may be cut, but only at higher rates of seigniorage than are charged for ordinary unreserved woods.

The following statement will illustrate the way in which the trees are classified and the number of trees reserved in some of the districts:—

District.	Trees not to be cut except under special permission, and for which no rates of seigniorage are fixed.	Reserved trees, for which rates of seigniorage are fixed.	Total reserved trees.
Ganjam	..	19	19
Cuddapah	8	19	27
Kunool	4	8	12
North Arcot	8	17	25
South Arcot	..	33	33
Trichinopoly	5	24	29
Madura	6	25	31
Coimbatore	8	31	39
Salem	6	24	30
South Canara	3	7	10

The seigniorage varies from one rupee eight annas per cart-load in Ganjam to six rupees in Cuddapah and North Arcot for timber in the rough, while for wrought timber it ranges from two rupees in the former to twelve rupees in the two latter districts.

14. Seigniorage on firewood was, in 1860, five annas per cart-load; in 1868 it was raised to ten annas per 1,000 lbs. for fuel purchased by railways; and in 1869 it was further increased to one rupee per 1,000 lbs. for all purchasers, except in the districts of Ganjam and Kurncol, where low rates have always prevailed. Eventually a reduction to six annas per 1,000 lbs. was ordered for all except railway companies, who still pay one rupee per 1,000 lbs. In some districts, such as Kurnool, and Salem (until quite lately), head-loads are free, and in some the rates charged for quantities of less than 1,000 lbs. do not correspond with the proportion prescribed by the Board of Revenue of 1000: 200: 50 for cart, bullock and head load. In Godávari only two annas per cart-load is charged, and in Kurnool the old four-anna rate remains unaltered, while smaller quantities are free. In Ganjam the seigniorage has been raised from two and

a-half to four annas per cart-load. For purchasers other than the railway companies a cart-load is, in most districts, considered as equivalent to 1,000 lbs., though in reality this is not the case.

15. The seigniorage on charcoal is, generally speaking, one rupee eight annas per cart-load, or four times the amount charged for firewood: corresponding rates are charged for bullock, ass, and head loads. In Godávari, however, no charge is made at all; in South Canara it is one rupee per 1,000 lbs., and on the Nílgiris four annas per head-load.

16. The seigniorage on bamboos is generally one rupee per cart-load, with proportionate reductions for bullock, ass, and head loads; the charge for a head load is usually one anna. In Salem and South Arcot twelve annas is the rate per cart-load in the rough, and only six pies per head-load. An enhanced rate is levied on split bamboos of double, or half, or three-quarters as much again as that charged for them in the rough. In the forest taluks of Godávari, the seigniorage is charged by the thousand, being five and a-half rupees for female and five rupees for male bamboos. In Ganjam and Kurnool the seigniorage is only five annas per cart-load.

17. Seigniorage is levied on several kinds of bark, the following being the most important:—

Cassia auriculata: Thangédu, Tel.; Avaram, Tam. Used for tanning and dyeing leather. The rate is two rupees per cart-load in the districts adjoining Mysore and in some other districts. In Kurnool the rate is one rupee per cart-load, and in Trichinopoly twelve annas.

Acacia leucophlœa: Thellathumma, Tel.; Vel-vélam, Tam. Used in the manufacture of arrack, and to produce fibre. The rates of seigniorage vary from five rupees per cart-load in Salem to one rupee in Cuddapah.

Acacia arabica, Babul: Nallathumma, Tel.; Karuvélam, Tam. Used for tanning and medicine, is charged two rupees per cart-load in Madura and one rupee in Cuddapah.

Seigniorage is levied on a few other descriptions of bark, but is generally only so levied locally.

In Madura seigniorage is levied on rattans at the rate of one rupee eight annas per cart-load and one anna six pies per head-load. In the Cuddapah reserves the grass is sold at three pies per bundle or four annas per cart-load. The fees are collected by the village officers.

18. *III. Revenue from confiscated drift or waif wood.*—To this class belong at present, first, the proceeds of the sale of timber, &c., which, having been removed from Government forests contrary to rule or under suspicious circumstances, has been seized by the Forest or Police Departments, and, after due magisterial enquiry, forfeited to Government and sold by auction; second, the sale proceeds of wood stranded on river banks or beds within the precincts of Government forests, and to which no private claim is substantiated. Waif wood on the coasts is first notified and then, if not claimed, sold to the highest bidder, but the proceeds are not credited to forest revenue.

JUNGLE CONSERVANCY.

19. Jungle Conservancy revenue is levied under paragraph 92 of the Standing Orders of the Board of Revenue, and is classified under jungles, plantations, and topes. The jungles are in some instances worked departmentally, as for instance the Sriharikóta forest in Nellore, but the bulk of the revenue is obtained under the License and Voucher System, from seigniorage on timber, firewood, bamboos, charcoal, minor produce and barks, and from grazing dues. In Kistna, two soapnut jungles have been leased at an annual rental. Revenue has sometimes, as in Chingleput District a few years back, been obtained by the lease of firewood jungles which have been cleared by the contractors. The sale of trees on Government waste-land not under the Forest Department control, which have died or been blown down, is also in some districts a source of income to the Fund. The rates charged under the License and Voucher System are generally similar to those charged by the Forest Department, but information on this point is not available for most districts. In the Kistna District, where the Forest Department has hitherto had no agency, the rate for a cart-load of firewood is four annas and for a head-load four pies. For wood removed in boats a fee of eight annas ten pies per ton is levied. The rate for charcoal is one rupee eleven annas per cart-load, or one anna per basket. A seigniorage of three pies per head-load is collected for grass cut in the Kondapalle reserve. In Ganjam, villagers cutting firewood for sale in Government waste are required to pay a fee of one rupee per annum and take out a license. The rates for charcoal in Bellary are ten annas per cart-load and eight pies per head-load. In some districts a considerable revenue is derived from barks. The rate of seigniorage on the bark of *Cassia auriculata* has lately been fixed at two rupees per cart-load and two annas per head-load of bark, and six annas a cart-load and four pies a head-load of wood, in the districts bordering on Mysore and in South Arcot and Madura.

20. The revenue from plantations is small and confined to a few districts, and is for the most part derived from sales of firewood and charcoal.

21. The topes yield a large revenue, partly from timber, firewood and charcoal, but chiefly from the annual rent of the fruit trees of which most of them are composed, and the rent of scattered fruit trees on Government land. The right to collect the fruit or leaves is generally sold by auction.

22. Palmyra trees on Government land are, under the rules, allowed to be cut for building on payment of twelve annas, but in some districts, *e.g.*, Cuddapah, as much as two rupees is charged per tree. In Salem a very large revenue is derived from the rent of scattered palmyras and topes of the same tree; and in Coimbatore there are considerable receipts from the same source.

23. In some instances, as in Bellary, Kurnool and Tanjore, where the receipts have been less than the necessary expenditure, the difference has been made good, under the orders of Government, from the Surplus Pound Fund or Provincial Revenue. The Jungle Conservancy Fund being strictly local, the surplus of one district cannot be used to supplement that of another district where there may be a deficit.

24. *Free Passes.*—Both the Forest and Jungle Conservancy rules allow timber and firewood to be removed without payment in certain cases. The rules on this subject, in force in most forest divisions, are what are known as the "Madura Rules," prepared by Major Campbell Walker in 1869. Under these rules, Government ryots are allowed to remove firewood in head-loads for domestic use free and without pass. Free passes are also granted by certain Revenue and Forest Officers to Government ryots whose houses have been destroyed by fire or accident, enabling them to cut timber—which, as a rule, must be of the unreserved kinds—and bamboos in undemarcated forests. The quantity of timber or bamboos granted is regulated by the size of the house. Similar free passes are issued for timber for agricultural implements, for which a scale of supposed annual requirements is laid down. In some districts a system slightly differing from this has been followed. On the Nilgiris free passes are granted for wood required for burning corpses. The Jungle Conservancy rules (paragraph 92, Standing Orders of the Board of Revenue) allow villagers to cut firewood for domestic use (not for sale, except in their own village) in the jungles of their own, or, if necessary, of adjoining villages. *Bonâ fide* ryots are also allowed to cut the less valuable kinds of timber free, for the erection of dwelling houses and for agricultural implements.

25. Twigs and leaves for manure are generally allowed to be cut without restriction in the unreserved jungles.

26. In regard to the free use by ryots of firewood for the manufacture of the produce of their own lands Government have given the following rulings:—

In Government Order No. 27, of the 6th January 1871, it was said that "The rule is that ryots may have fuel free from unreserved tracts for use, but not for sale, and the Government are not disposed to curtail this privilege . . . . . It is desirable by all means to encourage such small industries as the manufacture of indigo and sugar by the growers." And again in passing orders upon the proposals of the Board of Revenue for reducing the rate of seigniorage on firewood from one rupee to six annas per 1,000 lbs., the Government said, in Government Order, No. 1225, dated 31st October 1873, that "The Governor in Council is of opinion that it is in accordance with immemorial usage to permit villagers to cut firewood free for the manufacture of the produce of their own lands, and provision to this effect should be made in the Jungle Conservancy rules."

These orders have been carried out in all districts, except North Arcot, where fees have hitherto been charged for firewood used by ryots to convert sugarcane juice into jaggery.

27. The whole question of the free grant of wood from Government land to ryots and others has been reviewed by Colonel Beddome in his letter of March 1879, embodied in Government Order of the 8th August 1879, and orders have recently been issued by Government (Government Order, 4th July 1882) for the careful consideration of the subject, and the revision of the rules in force, on the passing of the Forest Act.

LIST OF VERNACULAR TERMS.

Compiled by H. A. Sim, M.C.S., Deputy Conservator of Forests.

Amani	...	... Lands and other sources of revenue held and managed directly by Government.
Amildar	...	... A name usual in Mysore for the officer in charge of a taluk, elsewhere called a Tahsildar.
Amrat Mahal		... A Government cattle-rearing establishment, used chiefly for military purposes.
Anicut	...	... A dam thrown across a river or stream to bank back the water for irrigation or other purposes.
Badagas	...	... A large tribe on the Nílgiris, believed to have come from Mysore
Bratties	...	... Pieces of dried cowdung, used as fuel.
Catamaran	...	... A boat, formed only of three or four logs tied together, generally used by the Madras fishermen.
Cawnie	...	... 6,400 square yards, or 1·32 acres.
Chetty	...	... One of the merchant or shop-keeper caste.
Darogah	...	... The head of a police or guard station.
Darkhast	...	... An application for permission to take up Government land on patta.
Dhya	...	... *Vide* Kumri.
Dufterbund	...	... The Office Clerk in charge of the dufters or bundles of office records.
Hobli ...	...	... A subdivision of a taluk. A Mysore word.
Inamdar	...	... The holder of land exempted by the State, either wholly or partially, from payment of land assessment.
Irulas	...	... One of the hill tribes of Coimbatore and the adjoining districts.
Jamabandi	...	... The annual settlement of the land revenue.
Kancha	...	... Government waste land let out for grazing.
Kotahs	...	... A Nílgiri hill tribe.
Koyas	...	... A Godávari hill tribe.
Kowl	...	... A lease of land, generally rent free for a term of years.
Kumaki	...	... Forest lands held by Wargdars, in aid of cultivated lands, for agricultural and domestic use, such as the cutting of wood and the gathering of leaves for manure.
Kumri	...	... A term applied to the system of shifting cultivation, usually carried on by hill tribes. This system is as follows:—A few acres of forest are felled one year, the wood is burnt, and a crop of grain is raised on the clearing; the next year this is abandoned, a fresh piece of forest is felled elsewhere, a crop is raised, and it, too, abandoned in its turn, and so on, a fresh clearing being made each year. This system of cultivation is carried on in most hill ranges, and is known by various names; *e.g.*, dhya in the Central Provinces, jhúm in Eastern Bengal, toila in Orissa, podu in the Northern Circars, ponakád in Salem, and toungya in Burma.
Kurnam	...	... A Village Accountant, called the Shánbóg in Mysore.
Kurumbas	...	... A Nílgiri hill tribe.
Lanka	...	... The alluvial islands and banks formed in river deltas.

MALAIÁLIES ...	... A hill tribe, chiefly in Salem.
MALAI ARASAN ...	... A hill tribe in Tinnevelly.
MALGUZAR ...	... A landholder under a tenure peculiar to the Central Provinces.
MITTADAR ...	... The holder of an estate on a tenure similar to that of a Zemindar.
PADUGAI ...	... River banks or lands adjoining river banks, liable to inundation.
PATEL	... The Mysore name for the headman of a village, elsewhere called a Reddi or Monigar.
PATTA	... A memorandum of the particulars of his holding and land assessment, given by the State to the landholder; usually considered as constituting a title to the land.
PATTADAR ...	... The holder of a patta.
PONAKÁD ...	... *Vide* KUMRI.
PORAMBOKE ...	... Land reserved by the State for public purposes, *e.g.*, village sites, roads, tankbeds, &c.
PULLÀRI ...	... The assessment on Government waste lands let out for grazing.
RYOT	... A landholder paying the full land assessment directly to Government.
SAMUDAYEM ...	... Literally, joint; usually applied to the tenure or lease under which the members of a village community hold lands, fisheries, or other rights in common.
SHÁNBÓG ...	... The Mysore name for the Village Accountant, elsewhere called the Kurnam.
SHEKDAR ...	... The Revenue Officer in charge of a hobli.
SHOLA	... A piece of evergreen forest.
SHROTRIEMDAR	... The holder of a shrotriem or estate, the land revenue of which has been assigned to him.
TALUK	... The division of a district which is in charge of a Tahsildar: several taluks usually form a division, and several divisions a district.
TODAS	... One of the Nílgiri hill tribes.
TOUNGYA ...	... *Vide* KUMRI.
WARGDARS ...	... A class of landholders peculiar to South Canara.
ZEMINDAR ...	... The holder of an estate under a permanently fixed land assessment.

VERNACULAR NAMES OF TREES AND SHRUBS.

Acha, Achi ...	*Kan.* ...	Hardwickia binata.
Adivi-nimma ...	*Tel.* ...	Atalantia monophylla.
Alingi	*Tam.* ...	Alangium Lamarckii.
Alli	*Tel.* ...	Memecylon *sp.*
Anaimullu ...	*Tam.* ...	Acacia Latronum.
Anjan	*Hind.* ...	Hardwickia binata.
Are	*Tel.* ...	Bauhinia racemosa.
Arikata	*Tel.* ...	Oplismenus Colonus.
Avaram	*Tam.* ...	Cassia auriculata.
Babul	*Hind.* ...	Acacia arabica.
Bajra	*Hind.* ...	Penicillaria spicata.
Balasu	*Tel.* ...	Canthium parviflorum.
Bandáru ...	*Tel.* ...	Dodonæa viscosa.
Bija	*Hind.* ...	Pterocarpus Marsupium.
Bikki	*Tel.* ...	Gardenia *sp.*
Billu	*Tel.* ...	Chloroxylon Swietenia.
Bité	*Kan.* ...	Dalbergia latifolia.
Burra	*Hind.* ...	Lagerstrœmia parviflora.
Buruga	*Tel.* ...	Cochlospermum Gossypium.
Chandanam ...	*Tel.* ...	Pterocarpus santalinus.
Chendanam ...	*Tam.* ...	Santalum album.
Chenengi ...	*Kan.* ...	Lagerstrœmia parviflora.
Chennangi ...	*Tel.* ...	Do. do.
Chigaru ...	*Tam.* ...	Albizzia amara.
Chikreni ...	*Tel.* ...	Do. do.
Chilla	*Tel.* ...	Strychnos potatorum.
Chiriman ...	*Tel.* ...	Anogeissus latifolia.
Chit-acha ...	*Tam.* ...	Bauhinia racemosa.
Dante	*Tel.* ...	Gymnosporia montana.
Devadáru ...	*Tel.* ...	Erythroxylon monogynum.
Dhamin	*Hind.* ...	Grewia vestita.
Dhebri	*Hind.* ...	Anogeissus latifolia.
Dirasana, Dirasina	*Tel.* ...	Albizzia Lebbek.
Goti	*Tel.* ...	Zizyphus xylopyra.
Gudova	*Tel.* ...	Semecarpus Anacardium.
Gumpena ...	*Tel.* ...	Odina Wodier.
Gunji	*Tel.* ...	Glycosmis pentaphylla.
Hingalat ...	*Kan.* ...	Balanites aegyptiaca.
Hingolee ...	*Hind.* ...	Do. do.
Hongay	*Kan.* ...	Pongamia glabra.
Honné	*Kan.* ...	Pterocarpus Marsupium.
Hundru	*Tel.* ...	Acacia eburnea.
Ibri	*Kan.* ...	Dalbergia latifolia.
Ippa	*Tel.* ...	Bassia longifolia.
Iriki	*Tel.* ...	Cordia Myxa.
Irumbili	*Tam.* ...	Maba buxifolia.
Itha	*Tel.* ...	Phœnix sylvestris.
Jala	*Tel.* ...	Acacia Latronum.
Jálári, Jálláři ...	*Tel.* ...	Shorea Talura.
Jammi	*Tel.* ...	Prosopis spicigera.
Jana	*Kan.* ...	Grewia vestita and tiliæfolia.

KACHAN	*Tam.* ...	... Memecylon *sp.*
KADUKAI	*Tam.* ...	... Terminalia Chebula.
KAKI-BIRA	*Tel.* ...	... Hugonia Mystax.
KALLA, KALLIA	*Tel.* ...	... Carissa Carandas.
KAL-TEK	*Tel.* ...	... Dillenia bracteata.
KANKUDU	*Tel.* ...	... Sapindus trifoliatus.
KANUGA	*Tel.* ...	... Pongamia glabra.
KARAI	*Tam.* ...	... Canthium parviflorum.
KARAKA	*Tel.* ...	... Terminalia Chebula.
KARANGÁLI	*Tam.* ...	... Acacia Catechu.
KARA-SEDI	*Tam.* ...	... Canthium parviflorum.
KAREPÁKU	*Tel.* ...	... Murraya Königii.
KARU-VELAM	*Tam.* ...	... Acacia arabica.
KHAIR	*Hind.* ...	... Acacia Catechu.
KHIRI	*Tam.* ...	... Elæodendron Roxburghii.
KILUVAI	*Tam.* ...	... Protium caudatum.
KOI	*Tel.* ...	... Ixora parviflora.
KOLAMUKKA	*Tel.* ...	... Holarrhena antidysenterica.
KOMI, KUMBI	*Tel.* ...	... Webera corymbosa.
KONAI	*Tam.* ...	... Cassia Fistula.
KONDABURUGA	*Tel.* ...	... Cochlospermum Gossypium.
KONDA-CHIKRENI ...	*Tel.* ...	... Albizzia odoratissima.
KONDA-GUMARI	*Kan.* ...	... Vitis pallida.
KONDA-MAMIDI	*Tel.* ...	... Protium caudatum.
KONDA-PULIKI	*Tel.* ...	... Givotia rottleriformis.
KONDA-RAGI	*Tel.* ...	... Protium caudatum.
KONG	*Tam.* ...	... Hopea *sp.*
KOONGTIAM	*Tam.* ...	... Boswellia thurifera.
KORA	*Tam.* ...	... Ixora parviflora.
KUGLI	*Kan.* ...	... Acacia Catechu.
KUKUDU	*Tel.* ...	... Sapindus emarginatus.
KUL-HATHARI	*Kan.* ...	... Chickrassia tabularis.
KUNDRIKAM	*Tam.* ...	... Canarium indicum.
KURKATURA	*Tam.* ...	... Zizyphus glabrata.
MAILI	*Tam.* ...	... Vitex altissima.
MANCHI-BIRA	*Tel.* ...	... Hemicyclia sepiaria.
MANGA	*Tel.* ...	... Randia nutans.
MERIKALAM	*Tam.* ...	... Randia *sp.*
MHOWA	*Hind.* ...	... Bassia *sp.*
MOVI	*Tel.* ...	... Eugenia alternifolia.
MUGLI	*Kan.* ...	... Acacia Sundra.
MUSIDI	*Tel.* ...	... Strychnos Nux-vomica.
NAKKENA	*Tel.* ...	... Memecylon umbellatum.
NALLAMADDI	*Tel.* ...	... Terminalia tomentosa.
NALLA-THUMMA ...	*Tel.* ...	... Acacia arabica.
NALUVAI	*Tam.* ...	... Canthium umbellatum.
NAMÁI	*Tam.* ...	... Anogeissus latifolia.
NANG	*Tam.* ...	... Mesua ferrea.
NARUDU	*Tel.* ...	... Pterospermum suberifolium.
NARVU, NARVA	*Tel.* ...	... Premna tomentosa.
NEKANAY	*Tam.* ...	... Canthium didymum.
NEREDU	*Tel.* ...	... Eugenia Jambolana.
NERUVODI	*Tel.* ...	... Schrebera swietenioides.
NEVALI-ADUGU	*Tel.* ...	... Vitex altissima.
NIM	*Hind.* ...	... Melia indica.
NIRIDI	*Tel.* ...	... Elæodendron Roxburghii.
OTAI	*Tam.* ...	... Lebidieropsis orbicularis.
PALA, PALAI, PALI, PALU	*Tel.* ...	... Mimusops indica.
PARAMBAI	*Tam.* ...	... Acacia ferruginea.
PATSÁRI	*Tel.* ...	... Dalbergia paniculata.
PEDDA-MANGA	*Tel.* ...	... Randia *sp.*
PICHIKA-BIRA	*Tel.* ...	... Ehretia buxifolia.
PODANGINARI	*Tam.* ...	... Premna tomentosa.
POGADA	*Tel.* ...	... Mimusops Elengi.
PULAKI, PULUKI	*Tel.* ...	... Sterculia urens.
PUNISI	*Tel.* ...	... Olea *sp.*

... ...	———	...	... Eleusine coracana.
, RELLA	*Tel.*	...	... Cassia Fistula.
ALA	*Tel.*	...	... Wrightia tinctoria.
RA	*Hind.*	...	... Terminalia tomentosa.
AR	*Tel.*	...	... Briedelia retusa.
LER	*Hind.*	...	... Boswellia thurifera.
AMI	———	...	... Panicum miliare.
ANDRA	*Tel.*	...	... Acacia Catechu.
SANKESVARAM	*Tel.*	...	... Poinciana elata.
SEINDI	*Kan.*	...	... Phœnix sylvestris.
EMLICHAN	*Tam.*	...	... Erythroxylon monogynum.
SHEN-KURANI	*Tam.*	...	... Gluta travancorica.
SILLA	*Tam.*	...	... Strychnos potatorum.
SISHAM	*Hind.*	...	... Dalbergia latifolia.
SISSOO	*Hind.*	...	... Dalbergia Sissoo.
SUMI	*Tel.*	...	... Soymida febrifuga.
TADDA	*Tam.*	...	... Pterospermum suberifolium.
ARA	*Tel.*	...	... Do. do.
EGALI	*Tel.*	...	... Grewia *sp.*
EKA	*Tam.*	...	... Tectona grandis.
ELLA-PURUGUDU	*Tel.*	...	... Flüggea Leucopyrus.
ERANI	*Tam.*	...	... Webera asiatica.
THAMBA	*Tel.*	...	... Shorea Tumbuggaia.
THANAKKEN	*Tam.*	...	... Givotia rottleriformis.
THANDRA	*Tel.*	...	... Terminalia bellerica.
NGEDU	*Tel.*	...	... Cassia auriculata.
LA-THUMMA	*Tel.*	...	... Acacia leucophlœa.
IAM	*Tam.*	...	... Strychnos potatorum.
... ...	*Hind.*	...	... Euphorbia Nivulia.
MMA	*Tel.*	...	... Acacia arabica.
RA	*Tel.*	...	... Buchanania angustifolia.
I, TUKKI, TUNKI ...	*Tel.*	...	... Diospyros Melanoxylon.
INJI	*Tam.*	...	... Albizzia amara.
APAI	*Tam.*	...	... Grewia *sp.*
I	*Tel.*	...	... Maba buxifolia.
KANA, VAKKANI ...	*Tam.*	...	... Diospyros Chloroxylon.
LAMARAM	*Tam.*	...	... Acacia leucophlœa.
LANGI	*Tam.*	...	... Dalbergia paniculata.
LIDABA	*Tel.*	...	... Gelonium lanceolatum.
LUTURU	*Tel.*	...	... Dichrostachys cinerea.
L-VELAM	*Tam.*	...	... Acacia leucophlœa.
VGAY, VENGAI ...	*Tam.*	...	... Pterocarpus Marsupium.
NANGOO	*Tam.*	...	... Pterospermum suberifolium.
TEAK	*Tam.*	...	... Lagerstrœmia lanceolata.
A	*Tel.*	...	... Melia indica.
NJIL	*Tam.*	...	... Albizzia amara.
DDAN	*Tam.*	...	... Lebidieropsis orbicularis.
DISHA	*Tel.*	...	... Do. do.
DIYAN	*Tel.*	...	... Odina Wodier.
LINDA	*Tel.*	...	... Diospyros Chloroxylon.
GI	*Tel.*	...	... Pterocarpus Marsupium.
LANDAI	*Tam.*	...	... Zizyphus Jujuba.
YELLAMMA	*Tel.*	...	... Anogeissus latifolia.
YEPI	*Tel.*	...	... Hardwickia binata.
YETTI	*Tam.*	...	... Strychnos Nux-vomica.

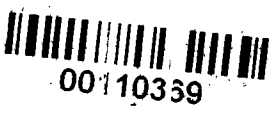
ADDITIONS AND CORRECTIONS.

Page 26, para. 63, line 29 from top. Read: Communes instead of Commune.
Page 36, para. 99, line 23 from top. Read: August instead of July.
Page 60, para. 167,

The areas irrigated by the Godávari, Kistna, and Cauvery rivers were taken from the Report of the Indian Famine Commission, Part II, page 83. The Report of Irrigation in the Madras Presidency for 1881-82, published since the above was written, gives the areas as follows:—

	ACRES.
Godávari	523,992
Kistna	287,027
Cauvery	897,221
Total ...	1,708,240

Page 81, para. 221, line 14 from top. Read: Ponnár instead of Ponniár.
Page 131, para. 351, line 26 from top. Read: It is remarkable that the cuttings for railway fuel have not yet extended any great distance into the hills and that the cuttings have hitherto been for the most part confined to the level ground in the valley.
Page 136, para. 364, line 19 from bottom. Read: iron was till five years ago made at Yerraguntlacótah.
Page 215, para. 581, line 5 from top. Read: forests instead of forets.
Page 228, para. 611, line 16 from bottom. Read: for fuel instead of or fuel.
Page 238, para. 651, line 9 from bottom. Read: Poráthi instead of Poratti.
Page 239, para. 652, line 15 from top. Read: District Forest Committees instead of District Fórest Committee.
Page 243, para. 662, line 4 from bottom. Read: *Meliosma Wightii* instead of *Millingtonia pungens*.
Page 338, opposite Mhowa. Read: *Bassia latifolia* instead of *Bassia sp.*
Page 338, opposite Nakkena. Read: *Canthium umbellatum* instead of *Memecylon umbellatum*.
Page 339, opposite Terani. Read: *Webera corymbosa* instead of *Webera asiatica*.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